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## **THE SOUTH WEST AFRICAN SPECIES OF COMMIPHORA**

by

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### ABSTRACT

The 25 species of *Commiphora* recognized in South West Africa are described and a key to the species is presented. Possible new species are discussed. Maps and sketches serve for illustration.

### INTRODUCTION

There has been a marked accumulation of information on the genus *Commiphora* of Southern Africa during the last two decades.

WILD (1959) published a revised classification of the genus and also produced the account of *Commiphora* in "Flora Zambesiaca" (1963).

DE WINTER (1968) made a valuable contribution. He recognized 27 species growing in the Republic of South Africa and South West Africa. A short description of each species was given and he also compiled a field key to the South African species.

MERXMÜLLER (1968) recognized 18 species of *Commiphora* in South West Africa and also compiled a comprehensive key to these species. He indicated the origin of the type material, reviewed the geographical distribution and cited the synonyms and a few representative specimens of each species.

The research on *Commiphora* in the Republic of South Africa and South West Africa was extended by the author of this paper.

A morphological and taxonomical study was made of the eighteen South African species (VAN DER WALT, 1973). Twelve of these species are also found in South West Africa.

In a preliminary report on the genus in South West Africa, 12 species of *Commiphora*, not represented in the Republic of South Africa, were described (VAN DER WALT, 1974). The habit, bark and leaves of each of the species were illustrated by means of photographs.

This publication is complementary to the previous paper (VAN DER WALT, 1974) and describes and delimits the South West African species more fully. With the exception of *C. edulis* (Klotzsch) Engl. and *C. mossambicensis* (Oliv.) Engl., which are confined to the Caprivi Strip, material of all the species was collected in their natural habitats.

All the *Commiphora* material of the following herbaria was studied (the international abbreviations of the herbaria are given in brackets):

Government Herbarium, Stellenbosch (STE)  
National Herbarium Pretoria (PRE)  
Bolus Herbarium, Cape Town (BOL)  
Botanische Staatssammlung, München (M)  
Royal Botanic Gardens, Kew (K)  
Conservatoire et Jardin botaniques, Geneve (G)  
British Museum (Natural History), London (BM)

In addition, specimens of the following herbaria were studied or cited:

Herbarium Department of General Botany, Pretoria (PRU)  
South African Museum Herbarium, Cape Town (SAM)  
National Herbarium of Victoria, Melbourne (MEL)  
Botanischer Garten und Botanisches Museum Berlin-Dahlem, Berlin (B)  
Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt (FR)  
Botanischer Garten und Institut für Systematische Botanik der Universität Zürich, Zürich (Z)  
Naturhistorisches Museum, Wien (W)  
Swedish Museum of Natural History, Stockholm (S)  
Muséum National d'Histoire Naturelle, Paris (P)  
Centro de Botânica da Junta de Investigações, Lisbon (LISC)

Botanical Institute of the University of Coimbra, Coimbra  
(COI)

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KEY TO THE SPECIES

- 1 Leaves simple, occasionally with 2 additional much smaller lateral leaflets on long shoots, leaves sessile or subsessile (exception *C. namaensis* with stalked leaves).
- 2 Branchlets not spine-tipped, flowers perigynous, pseudo-aril cupular without arms or with 2 commissural arms:
  - 3 Margin of leaves serrate-dentate, leaves stalked, occasionally with 2 additional much smaller lateral leaflets, lamina rotund or orbicular and relatively small (up to 1,5 x 1,2 cm), pseudo-aril with 2 long commissural arms, bark light grey, not peeling . . . . . 14. *C. namaensis*
  - 3 Margin of leaves entire, leaves sessile or subsessile, always simple, lamina narrowly elliptic to broadly elliptic and relatively large (usually much larger than 1,5 x 1,2 cm),

pseudo-aril cupular with 3 or 4 short lobes but without 2 long commissural arms, bark yellowish brown or reddish brown and usually peeling in papery pieces:

4 Leaves exceptionally large (7-)13(-20)x(3-)8(-14) cm, inflorescence thyrsoid up to 20 cm long without large leaf-like bracts, leaves and inflorescence pilose, fruit ovoid or obovoid, ca. 1,5 x 1,1 x 1 cm. . . . . 16. C. anacardiifolia

4 Leaves relatively smaller (1,5-)4(-10)x(0,8-)2,5(-6) cm, inflorescence simple or compound dichasial cymes or thyrsoid up to 8 cm long and often with large leaf-like bracts, leaves and inflorescence glabrous or sparsely to densely pilose, fruit ellipsoid and ca. 1,1 x 0,6 x 0,4 cm . . . . . 15. C. glaucescens

2 Branchlets spine-tipped, flowers hypogynous, pseudo-aril usually with 4 distinct arms of equal length reaching almost to apex of putamen:

5 Young branchlets smooth and purplish, leaves glaucous and margins rather coarsely crenate-serrate or almost entire, calyx glabrous, fruit ellipsoid and apiculate, bark grey . . . . . 3. C. merkeri

5 Young branchlets greyish or at least not purplish, leaves green or dark green and margins finely crenate-serrate, crenate-serrate, subentire or entire, calyx with glandular hairs or glabrous, fruit subglobose or ellipsoid but not apiculate, bark yellowish-white, greyish-green or yellowish-green:

6 Lamina of simple leaves broadly elliptic to suborbicular, dark green and shiny, margins often entire or subentire, calyx glabrous, flowers unisexual, bark yellowish-white and peeling around the stem in papary strips . . . . . 2. C. discolor

6 Lamina of simple leaves elliptic, narrowly obovate or obovate, green and not shiny, margins usually finely crenate-serrate or serrate, calyx with glandular hairs or glabrous, flowers bisexual or unisexual, bark greyish-green or yellowish-green and flaking in small papery pieces:



7 Calyx glabrous, lamina of simple leaves or terminal leaflet elliptic, narrowly obovate or obovate, (1,6-) 2,5(-5,5)x(0,8-)1,6(-3,2) cm, margin finely crenate-serrate or occasionally almost entire, many-stemmed shrubs, occasionally small trees with single trunk . . . . . 5. C. pyracanthoides

7 Calyx with glandular hairs, lamina of simple leaves or terminal leaflet obovate or elliptic, (2-)3,5(-6,5)x(1,2-) 2,5(-4,5) cm, margin crenate-serrate or occasionally almost entire, trees with a single trunk, occasionally shrub-like . . . . . 4. C. glandulosa

1 Leaves trifoliolate or pinnate, leaves stalked:

8 Leaves and young branchlets sparsely to densely pilose, pubescent or tomentose:

9 Young branchlets mostly spine-tipped, leaves trifoliolate, flowers borne in clusters, putamen very rugose . . . . . 1. C. africana

9 Young branchlets not spine-tipped, leaves trifoliolate or pinnate, flowers borne in dichasial cymes or thyrsoid inflorescences, putamen smooth:

10 Acroscopic margin of lateral leaflets incised to rachis but basiscope margin decurrent along rachis . . . . . 17. C. wildii

10 Both margins of lateral leaflets as usually incised to rachis or petiolule:

11 Leaves only pinnate, usually at least 6-jugate, leaflets abruptly acuminate at both ends, petiolules relatively long and slender, pseudo-aril cupular with 4 arms of equal length reaching almost to apex of putamen . . . . . 9. C. multijuga

11 Leaves trifoliolate or pinnate but then usually less than 6-jugate, leaflets not abruptly acuminate at both ends, petiolules of variable length but not slender, pseudo-aril cupular or with 2-4 arms or lobes of unequal length:

12 Leaflets scabrous above, petiole with medullary vascular bundles . . . . . 18. C. edulis

12 Leaflets not scabrous above, petiole without medullary vascular bundles:

13 Margin of leaflets entire, flowers with a fleshy disc, pseudo-aril with 2 long commissural arms and 2 shorter facial arms, bark not papery:

14 Leaflets elliptic, oblong-elliptic or obovate, apex not abruptly acuminate, young branchlets, leaves and calyx without conspicuously golden glandular hairs, disc of flower 4-lobed . . . . . 8. C. mollis

14 Leaflets ovate, broadly ovate, suborbicular or oblate, apex often abruptly acuminate, young branchlets, leaves and calyx with conspicuously golden glandular hairs, disc of flower 8-lobed . . . . . 10. C. mossambicensis

13 Margin of leaflets usually at least partly crenate-serrate, flowers without a fleshy disc, pseudo-aril with 2 broad facial lobes, bark often papery:

15 Many-stemmed shrubs or bush, leaves always sparsely pilose to densely pubescent, petiole not slender, pseudo-aril covering lower 1/3-1/2 of putamen . . . . . 22. C. angolensis

15 Tree with a single trunk, leaves glabrous, sparsely pilose to pubescent, petiole often slender, pseudo-aril covering 1/3 - 3/4 of putamen . . . . . 21. C. tenuipetiolata

8 Leaves and young branchlets glabrous (irrespective of glandular hairs):

16 Leaves pinnate:

17 Leaflets subacicular (up to 1 mm broad), petals sparsely villose or villose on outside, pseudo-aril absent, bark papery . . . . . 23. C. kraeuseliana

17 Leaflets lanceolate, elliptic, suborbicular or oblate (at least 3 mm broad), petals glabrous or with glandular hairs outside, pseudo-aril present, bark not papery:

18 Margin of leaflets entire, leaflets abruptly acuminate at both ends, pseudo-aril cupular with 4 arms of equal length reaching almost to apex of putamen, bark reddish-grey to dark grey . . . . . 9. C. multijuga

18 Margin of leaflets crenate-serrate, leaflets not abruptly acuminate at both ends, pseudo-aril cupular without long arms, bark light grey to pale brown:

19 Leaflets narrowly lanceolate or lanceolate, margin crenate-serrate, petiole with medullary vascular bundles . . . . . 20. C. crenato-serrata

19 Leaflets suborbicular to obovate, margin coarsely crenate-serrate, petiole without medullary vascular bundles . . . . . 19. C. saxicola

16 Leaves trifoliolate:

20 Leaflets linear, cultrate or narrowly oblanceolate and usually irregularly lobed, leaflets sessile or subsessile:

21 Leaves up to 8 cm long, leaflets linear to cultrate, margin coarsely dentate-serrate, branchlets slender, stamens only 4, pseudo-aril present . . . . .  
. . . . . 12. C. gracilifrons

22 Leaves up to 2 cm long, leaflets cultrate or narrowly oblanceolate, margin entire (irrespective of lobes), branchlets short and stout, stamens 8, pseudo-aril absent . . . . . 25. C. cervifolia

20 Leaflets of variable shape but never linear or cultrate and never irregularly lobed, leaflets stalked or subsessile:

23 Margin of leaflets entire, flowers hypogynous with disc lobes not adnate to perianth, pseudo-aril with 4 arms of equal length reaching almost to apex of putamen, putamen with a prominent hump on the less convex face:

24 Shrub with many stems of ca. 2,5 cm in diameter sprouting forth from ground level, bark reddish-brown, usually not peeling . . . . . 7. C. giessii

24 Shrub-like tree with a short trunk branching into relatively thick stems, bark yellowish-white to silvery, peeling around the stem in papery strips . . . . . 6. C. virgata

- 23 Margin of leaflets not entire, flowers perigynous with disc lobes adnate to hypanthium, pseudo-aril absent or with arms or lobes of unequal length, putamen without a prominent hump on the less convex face:
- 25 Leaflets narrowly oblanceolate to oblanceolate, stamens only 4 . . . . . 13. C. oblanceolata
- 25 Leaflets cordate, obovate, orbicular or elliptic, stamens 8:
- 26 Petiole usually relatively long and slender, pedicels longer than 4 mm, pseudo-aril with 2 facial lobes but without commissural arms, bark peeling . . . . . 21. C. tenuipetiolata
- 26 Petiole relatively short and not slender, pedicels up to 1 mm long, pseudo-aril absent or with 2 commissural and 1-2 facial arms, bark usually not peeling:
- 27 Margin of leaflets undulate, crenate, or almost entire, pseudo-aril absent, fruit ellipsoid, shrub-like tree with a short trunk branching near ground level into thick stems . . . . . 24. C. capensis
- 27 Margin of leaflets finely crenate-serrate, pseudo-aril with 2 commissural and 1-2 facial arms, fruit ovoid, shrubs with many relatively thin stems sprouting forth from ground level . . . . . 11. C. dinteri

1. Commiphora africana (A. Rich.) Engl. in A. DC., Monogr. Phan. 4: 14 (1883); Merxm., Prod. Fl. S.W. Afr. 23: 70: 4 (1968); J. J. A. v. d. Walt in Bothalia 11, 1&2: 68, Fig. 27-32 (1973). Type: Senegal, Kayar, LEPRIEUR s.n. (P, holo., only photo seen; isotypes!)

- = Heudelotia africana A. Rich.
- = Balsamodendrum africanum (A. Rich.) Arn.
- = Balsamea pilosa Engl.
- = Commiphora pilosa (Engl.) Engl.
- = C. loandensis Engl.
- = C. rubriflora Engl.

- = *C. nkolola* Engl.
- = *C. sambesiaca* Engl.
- = *C. calciicola* Engl.

Dioecious many-stemmed shrub usually less than 1 m tall or small tree with a single trunk up to 4 m tall, bark grey or greyish-green, occasionally flaking locally in small yellowish papery pieces, young branchlets pilose to tomentose, mostly spine-tipped. Leaves trifoliolate, pilose to tomentose, green, petiole 0,2-3,5 cm long, leaflets broadly obovate or broadly elliptic, sessile or subsessile, margin coarsely crenate or crenate-serrate, apex obtuse to acute, base cuneate or truncate, terminal leaflet (0,8-) 1,8 (-6,7) x (0,6-) 1,3 (-5) cm, lateral leaflets (0,4-) 0,8 (-3,5) x (0,3-) 0,7 (-3) cm. Inflorescence: flowers borne in clusters. Flowers unisexual, hypogynous, glabrous, pedicel 1-2,5 mm long, disc 4-lobed, not adnate to perianth, stamens 8. Fruit subglobose, ca. 1,5 x 1,2 x 1,2 cm, glabrous, putamen very rugose, pseudoaril red, with 4 arms of variable size and form, often also isolated fragments, 2 commissural arms reaching almost to apex of putamen, 2 facial arms of variable length.

1713 (Swartbooisdrif): 15 km W. of Otjansasemo (-AD), VAN DER WALT & GIESS 290 (PRE, WIND, STE); Etanga (-CC), DE WINTER & LEISTNER 5452 (PRE, WIND, M); Ombazu (-DD), VAN DER WALT & GIESS 296 (PRE, WIND, STE). 1714 (Ruacana Falls): Halfway between the Border Road and Ruacana Falls (-AD), DE WINTER & GIESS 7094 (WIND, G, M); 48 km S. of Ruacana - Oshakati Road (-CA), VAN DER WALT & GIESS 300 (PRE, WIND, STE). 1715 (Ondangua): 1 km E. of Oshikango (-BD), RODIN 8944 (M). 1719 (Runtu): near Runtu (-DD), DE WINTER 3755 (PRE, WIND); RODIN 9144 (M). 1813 (Ohopoho): 23 km W. of Kaoko-Otavi (-AB), VAN DER WALT & GIESS 299 (PRE, WIND, STE); Okavare (-BB), ABNER 43 (PRE, WIND, M). 1814 (Otjitundua): 24 km E. of Ohopoho (-AA), MERXMÜLLER & GIESS 1506 (PRE, M); 32 km N. E. of Ohopoho (-AA), VAN DER WALT 283 (PRE, WIND, STE); 110 km N. W. of Otjovasandu (-AD), VAN DER WALT & GIESS 278 (PRE, WIND, STE); 5 km S. of Otjitundua (-CD), GIESS & LEIPPERT 7342 (WIND, M). 1815 (Okahakana): 78 km N. of Okaukuejo (-BD), DE WINTER 3615 (PRE, WIND, M). 1816 (Namutoni): 21 km N. of Namutoni (-DB), DE WINTER & GIESS 6807 (PRE, G, M); N. of Namutoni (-DD), GIESS & SMOOK 10567 (M). 1817 (Tsintsabis): Farm Leeudrink (-CC), LE ROUX 249 (PRE, WIND). 1824 (Kachikau): near Linyanti (-AA), KILLICK & LEISTNER 3171

(PRE, WIND, M). 1914 (Kamanjab): Farm Weissbrunn (-BC), SCHWERDTFEGER 1/190 (WIND); Farm Hazeldene (-BC), DE WINTER & LEISTNER 5122 (PRE, WIND, M); Kamanjab (-DB), MERXMÜLLER & GIESS 1552 (WIND, M). 1915 (Okaukuejo): near Okaukuejo (-BA), GIESS, VOLK & BLEISSNER 6053 (WIND, M); S. of Okaukuejo (-BB), GIESS & SMOOK 10597 (M). 1916 (Gobaub): Etosha, Halali (-BA), GIESS & SMOOK 10585 (M). 1917 (Tsumeb): Tsumeb (-BA), VOLK 2594 (M); Farm Heidelberg (-BB), WALTER 335 (WIND); Farm Bobos (-BC), TÖLKEN & HARDY 952 (PRE, WIND, M); Otavi (-CB), DINTER 5236 (PRE, G, Z). 1919 (Kanovlei): Kanovlei (-AB), LE ROUX 84 (PRE, WIND); GIESS 10129 (M). 1920 (Tsumkwe): Cigarette (-BA), MAGUIRE 2223 (PRE, WIND, M); 29 km S. of Gore (-BD), GIESS 10074 (PRE, WIND, M); Tsumkwe (-DA), GIESS, WATT & SNYMAN 11109 (WIND, M); STORY 6302 & 6109 (PRE, WIND). 2015 (Otjihorong): 74 km W. of Outjo (-BA), URSCHLER s.n. (M). 2016 (Otjiwarongo): Omatjenne (-AD), VOLK 12029 (M). 2017 (Waterberg): Otjosongombe (-AD), LIEBENBERG 4764 (PRE, WIND); Okosongomingo (-CA), VOLK 348 (M). 2019 (Eiseb): 56 km N.E. of Epata (-CC), GIESS 9743 (PRE, M). 2020 (Kaukaveld): 8 km S. of Nama Pan (-BA), STORY 6405 (PRE). 2118 (Steinhausen): Farm Brabant (-AB), GAERDES s.n. (WIND).

(see fig. 1)

WILD (1963) distinguishes between var. *africana* and var. *rubriflora* (Engl.) Wild. The calyx and pedicels of the var. *rubriflora* are hairy, while those of the var. *africana* are glabrous. The flowers of all South African and South West African specimens examined, are glabrous and it is likely that only the var. *africana* is represented in these two countries.

*C. africana* is extremely widely distributed and has been recorded from more than 30 countries in Africa. It is also very variable in size, form and hairiness of the leaflets. The pseudo-aril of the South African and South West African representatives differs from the description given by WILD (1963). It appears that very little is known of the pseudo-aril of *C. africana* from other countries and further investigation could prove that it is in fact more than one species.

2. *Commiphora discolor* Mendes in Bol. Soc. Brot. ser. 2, 41: 155; t. 1 & 2 (1967); Merxm., Prod. Fl. S.W. Afr. 23: 70: 6 (1968); Grandvaux Barbosa, Carta Fitogeografica Angola: 250 (1970); J. J. A. v. d. Walt in Madoqua ser. 1, 8: 10,

t. 11-13 (1974). Type: Angola, Huila, MENDES 1693 (LISC, holo. !; BM!; COI!).

Dioecious tree 3-9 m tall with a single trunk, bark yellowish-white, peeling around the stem in papery strips, young branchlets glabrous, often spine-tipped. Leaves usually simple but on long shoots often trifoliolate with smaller lateral leaflets, glabrous, dark green and shiny, subsessile, margin entire, subentire or crenate-serrate, lamina of simple leaves broadly elliptic to sub-orbicular, 3-6 x 2, 5-4 cm, apex truncate or acute, base truncate or cuneate, leaflets of trifoliolate leaves elliptic to broadly elliptic, sessile or subsessile, apex acute, base cuneate, terminal leaflet 2, 8-7 x 1, 3-4, 7 cm, lateral leaflets 1, 4-3, 2 x 0, 7-1, 5 cm. Inflorescence: flowers borne in reduced cymes, glabrous. Flowers unisexual, hypogynous, subsessile, glabrous, disc not seen, stamens 8. Fruit subglobose, ca. 9 x 8 x 8 mm, glabrous, putamen smooth, pseudo-aril with 4 (3) arms of equal length reaching almost to apex of putamen.

1712 (Posto Velho): Ombepera (-DB), DE WINTER & LEISTNER 5490 (PRE, M). 1713 (Swartbooisdrif): 15 km W. of Otjanganasemo (-AD), VAN DER WALT & GIESS 291 (PRE, WIND, STE).

(see fig. 2)

3. Commiphora merkeri Engl. in Bot. Jahrb. 44: 144 (1910); J. J. A. v. d. Walt in Bothalia 11, 1 & 2: 63, fig. 14-19 (1973). Type: Tanzania, Nguruka, MERKER 565 (B, holo. †; K, fragment!).

= Commiphora viminea Burt Davy

Dioecious tree 2-3 m tall with a single trunk, bark grey with dark patches, peeling around the stem in yellowish papery strips, young branchlets glabrous, often spine-tipped. Leaves simple but on long shoots presumable occasionally trifoliolate with smaller lateral leaflets, with long glandular hairs at base but otherwise glabrous, glaucous, subsessile, narrowly obovate or elliptic, 0, 7-1, 6 x 0, 5-0, 9 cm, margin rather coarsely crenate-serrate or almost entire, apex obtuse seldom acute, base cuneate. Inflorescence: flowers borne in clusters. Flowers unisexual, hypogynous, glabrous, pedicel 2-10 mm long, disc 4-lobed, not adnate to perianth, stamens 8 (fig. 26 a + a<sub>1</sub>). Fruit ellipsoid, 1 x 0, 6 x 0, 5 cm, glabrous, apiculate, putamen and pseudo-aril not seen.



1812 (Sanitatas): between Sanitatas and Otjikongo (-BB), MERXMÜLLER & GIESS 1457 (PRE, WIND, M). 1914 (Kamanjab): 49 km E. of Sesfontein (-AC), VAN DER WALT 239 (PRE, WIND, STE).

(see fig. 3).

In comparison with the South African form of *C. merkeri*, the few plants seen in South West Africa are smaller and their bark lacks the large, dark-coloured lenticels. No ripe fruits of the South West African form were seen, but the flowers resemble those of the South African plants.

*C. merkeri* could be conspecific with *C. ellenbeckii* Engl. and probably also with a few other Central Africa species. The fragment of the type specimen of *C. merkeri* at Kew is very poor, and little is known of the pseudo-arils of these allied species. A comparison of the ripe fruits is needed to solve the problem.

4. *Commiphora glandulosa* Schinz in Bull. Herb. Boiss. 2, 8: 633 (1908); J. J. A. v. d. Walt in Bothalia 11, 1 & 2: 57, fig. 1-7 (1973). Lectotype: S. W. A., Ombanje, SCHINZ 767 (Z!).

- = *Commiphora lugardae* N. E. Br.
- = *C. seineri* Engl.
- = *C. berberidifolia* Engl.
- = *C. pyracanthoides* subsp. *glandulosa* (Schinz) Wild.

Polygamous or dioecious tree with a single trunk 2-10 m tall, occasionally shrub-like, bark yellowish-green or greyish-green, flaking in small yellowish papery pieces, young branchlets glabrous, spine-tipped. Leaves usually simple but on long shoots often trifoliolate with smaller lateral leaflets, with long glandular hairs at base but otherwise glabrous, green, subsessile, margin crenate-serrate occasionally almost entire, apex acute or obtuse, base cuneate, lamina of simple leaves or terminal leaflet obovate or elliptic, (2-) 3, 5 (-6, 5) x (1, 2-) 2, 5 (-4, 5) cm, lateral leaflets elliptic, (0, 8-) 1, 5 (-3) x (0, 4-) 0, 7 (-1, 5) cm. Inflorescence reduced cymes or flowers borne in clusters. Flowers bisexual, occasionally unisexual, hypogynous, pedicel 0, 5-1 mm long, pedicel and calyx with large glandular hairs, disc 4-lobed, not folded,

inside of lobes not grooved, not adnate to perianth, stamens 8. Fruit subglobose, ca. 1,4 x 1,3 x 1,2 cm, glabrous, putamen rugose, with a hump on less convex face, pseudo-aril red, with 4 arms of equal length reaching almost to apex of putamen.

1713 (Swartbooisdrif): 15 km W. of Otjangasemo (-AD), VAN DER WALT & GIESS 294 (PRE, WIND, STE). 1715 (Ondangua): Oshikango (-BD), RODIN 9026 (M); 32 km W. of Ndola Store (-DA), DE WINTER 3633 (PRE, WIND, M). 1719 (Runtu): near Runtu (-DD), DE WINTER 4041 & 3756 (PRE, WIND); DE WINTER 4041 (PRE, WIND, M); 24 km W. of Runtu (-DD), DE WINTER 3795 (PRE, WIND, M). 1813 (Ohopoho): Onganga (-BC), MERXMÜLLER & GIESS 1471 (PRE, WIND, M). 1814 (Otjitundua): 32 km N.E. of Ohopoho (-AA), VAN DER WALT & GIESS 279 (PRE, WIND, STE); 56 km N. of Otjovasandu (-CD), VAN DER WALT & GIESS 274 (PRE, WIND, STE). 1816 (Namutoni): 48 km S.E. of Ondangua (-AA), DE WINTER & GIESS 6938 (WIND, M). 1914 (Kamanjab): 27 km N.W. of Otjovasandu (-AB), VAN DER WALT 253 (PRE, WIND, STE). 1915 (Okaukuejo): Okaukuejo (-BB), VAN DER WALT 238 (PRE, WIND, STE); Leeubron (-BB), GIESS & SMOOK 10596 (WIND, M). 1917 (Tsumeb): Tsumeb (-BA), NÄGELSBACH 7 (PRE); Ombanje (-BC), SCHINZ 767 (Z); Farm Toggenberg (-BD), DE WINTER 2895 (PRE); Otavi (-CB), DINTER 5237 (PRE); Mpilila Island (-CC), KILLICK & LEISTNER 3368 (PRE). 1920 (Tsumkwe): near Gautscha Pan (-DC), STORY 6211 (PRE, M). 2016 (Otjiwarongo): Omatjenne (-AD), LIEBENBERG 4845 (PRE, WIND); Farm Graslaagte (-DB), WALTER 304 (WIND). 2017 (Waterberg): Waterberg Plateau (-AC), BOSS s.n. (PRE); Okosongomingo (-CA), VOLK 1500 (PRE). 2116 (Okahandja): 59 km N. of Okahandja (-DB), VAN DER WALT 235 (PRE, WIND, STE). 2215 (Trekkopje): Farm Okongava (-BB), SEYDEL 3014 (M). 2218 (Gobabis): Farm Kudu-berg (-DD), CODD 5830 (WIND). 2318 (Leonardville): Donnersberg (-BA), VOLK 11398 (M). 2416 (Maltahöhe): Naukluft Mountain Zebra Park (-AB), VAN DER WESTHUIZEN 53 (WIND); 49 km W. of Maltahöhe (-CD), VAN DER WALT 266 (PRE, WIND, STE); Farm Bergland (-DC), MERXMÜLLER & GIESS 830 (PRE, WIND, M); 34 km W. of Mariental (-DC), VAN DER WALT 265 (PRE, WIND, STE). 2417 (Mariental): near Hardap Dam (-BD), COETZEE 31 (PRE). 2519 (Koes): N.E. of Koes (-CC), GIESS 8352 (PRE, WIND, M).

(see fig. 4).

5. Commiphora pyracanthoides Engl. in Bot. Jahrb. 26: 368 (1899); Merxm., Prod. Fl. S.W. Afr. 23: 70:8 (1968) pro parte; J. J. A. v. d. Walt in Bothalia 11, 1 & 2: 60, fig. 8-13 (1973). Neotype: S. W. A., Little Karas Mountains, Holoog, PEARSON 9747 (K!).

Dioecious or polygamous many-stemmed shrub, 0,5-1,5 m tall, occasionally a small tree with single trunk up to 3 m tall, bark greyish-green or yellowish-green, flaking in small yellowish papery pieces, young branchlets glabrous, spine-tipped. Leaves usually simple but on long shoots often trifoliolate with smaller lateral leaflets, with long glandular hairs at base but otherwise glabrous, green, subsessile, margin finely crenate-serrate occasionally almost entire, apex acute or obtuse, base cuneate, lamina of simple leaves or terminal leaflet elliptic, narrowly obovate or obovate, (1,6-) 2,5 (-5,5) x(0,8-) 1,6 (-3,2) cm, lateral leaflets narrowly elliptic or elliptic,(0,4-) 0,8 (-2) x (0,2-) 0,3 (-1) cm. Inflorescence reduced cymes of flowers borne in clusters. Flowers unisexual or bisexual, hypogynous, pedicel 0,5-1 mm long, pedicel and calyx without glandular hairs (glabrous), disc 4-lobed, folded to form 4 large lobes towards the outside, inside of lobes deeply grooved, not adnate to perianth, stamens 8. Fruit ellipsoid to subglobose, ca. 1,1 x 0,8 x 0,7 cm, glabrous, putamen rugose, with a hump on less convex face, pseudo-aril red, with 4 arms of equal length reaching almost to apex of putamen (fig. 29, a & a<sub>1</sub>).

1813 (Ohopoho): 3 km W. of Omutati (-AC), DE WINTER & LEISTNER 5407 (PRE, WIND, M); 6 km S. W. of Ohopoho (-BB), VAN DER WALT & GIESS 288 (PRE, WIND, STE). 1816 (Namutoni): near Otjovasandu (-DD), LE ROUX & VAN DEEMTER 383 (PRE). 1914 (Kamanjab): near Otjovasandu (-AD), VAN DER WALT 255 (PRE, WIND, STE); Farm Hazeldene (-BC), DE WINTER & LEISTNER 5115 (PRE, WIND, M); Farm Franken (-DB), SCHWERDT-FEGER 1/131 (WIND). 1915 (Okaukuejo): Farm Westfalen (-CA), DE WINTER 3064 (PRE). 1920 (Tsumkwe): Tsumkwe (-DA), STORY 6108 (PRE, WIND, M); 32 km E. of Kuringkura (-DA), GIESS 9512 (PRE, WIND); Gautscha Pan (-DC), MAGUIRE 2199 (PRE). 2015 (Otjihorongongo): 4 km S. E. of Ugab Bridge (-CC), VAN DER WALT 230 (PRE, WIND, STE). 2017 (Waterberg): Okosongomongo (-CA), VOLK 300 (M). 2020 (Kaukaveld): Gam (-BB), STORY 5137 (PRE). 2114 (Uis): 2 km N. of Uis (-BB), VANDER WALT 225 (PRE, WIND, STE); 80 km W. of Brandberg West (-BC), VANDER WALT 219 (PRE, WIND, STE). 2115 (Karibib): Neineis (-AC), BOSS s. n. (PRE); Klein Spitskoppie (-CC), VAN DER WALT 209 (PRE, WIND, STE);

Kranzberg (-DC), VAN DER WALT 205 (PRE, WIND, STE); 3 km W. of Karibib (-DD), VAN DER WALT 204 (PRE, WIND, STE). 2116 (Okahandja): Farm Fahlwater (-CD), VAN DER WALT 200 (PRE, WIND, STE). 2117 (Otjosondu): near Satorius von Bach Dam (-BB), VAN DER WALT 235 (PRE, WIND, STE). 2215 (Trekkoepje): Okongava (-BB), SEYDEL 3031 (M). 2216 (Otjimbingwe): Okomitundu (-AB), SEYDEL 1399 (M); Farm Urusis (-CD), DE WINTER 2619 (PRE, WIND, M). 2217 (Windhoek): Farm Hohenau (-CB), WALTER 89 (WIND). 2218 (Gobabis): Witvlei (-AD), MASON 2617 (PRE); 22 km S. of Gobabis (-DB), CODD 5826 (PRE, WIND). 2318 (Leonardville): Farm Donnersberg (-BA), VOLK 11667 (M). 2617 (Bethanie): Between Tschaunaup and Seeheim (-DA), GERSTNER 6400 (PRE). 2717 (Chamaites): Holoog (-BD), PEARSON 9747 (K).

(see fig. 5)

In certain areas of South West Africa it is impossible to distinguish on habit alone between *C. glandulosa* and *C. pyracanthoides* because both species could be shrub-like or small trees. When occurring together in the same area, however, they can usually easily be distinguished as *C. glandulosa* is in the form of a small tree with a single bole and *C. pyracanthoides* a small, often many-stemmed shrub.

The most reliable means of distinguishing between flowering material of the two species, are the glandular hairs which occur on the calyx of only *C. glandulosa*. Flowers should be examined carefully as the number of glandular hairs vary considerably, and they are also usually present on the bracteoles of both species.

6. *Commiphora virgata* Engl. in Bot. Jahrb. 19: 139 (1894); Bot. Jahrb. 48: 470 (1912); Pflanzenfam. ed. 2, 19 a: 433 (1931); Exell & Mendonca in Consp. Fl. Angol. 1, 2: 300 (1951); Wild in Bol. Soc. Brot. ser. 2, 33: 82 (1959); De Wint. in Trees S. Afr. 20, 1: 18 (1968); Merxm., Prod. Fl. S.W. Afr. 23: 70: 9 (1968); J. J. A. v. d. Walt in Dinteria 9: 23, 24 (1973); in Madoqua ser. 1, 8: 20, t. 34-36 (1974). Type: S.W.A., Sorris-Sorris, GÜRICH 68 (B, holo. †; BM, sketch!).

Dioecious shrub-like tree 0,5-3 m tall, trunk branches near ground level into relatively thick stems, bark yellowish-white to

silvery, peeling around the stems in papery strips of the same colour, young branchlets glabrous, slender and often drooping, not spine-tipped. Leaves trifoliolate, glabrous, petiole 0,2-1,5 cm long, leaflets narrowly obovate, elliptic or broadly elliptic, petioles less than 1 mm long, margin entire, apex obtuse seldom retuse or acute, base cuneate, terminal leaflet (0,4-) 1,2 (-2,5) x (0,2-) 0,7 (-1) cm, lateral leaflets (0,4-) 1 (-1,5) x (0,2-) 0,5 (-0,7) cm. Inflorescence reduced cymes, glabrous, or flowers borne solitary. Flowers unisexual, hypogynous, subsessile, glabrous, disc 4-lobed, not adnate to perianth, stamens 8 (fig. 26 b & b<sub>1</sub>). Fruit irregularly subglobose, ellipsoid or obovoid, ca. 8 x 7 x 7 mm, glabrous, putamen rugose, with a prominent hump on upper half of less convex face, pseudo-aril white to reddish, with 4 arms of equal length reaching almost to apex of putamen, in some cases also isolated fragments (fig. 29 b & b<sub>1</sub>).

1712 (Posto Velho): near Ombepera (-DB), GIBSON 222 (WIND). 1812 (Sanitatas): 3 km W. of Okonjombo (-BD), GIESS & LEIPPERT 7417 (PRE, WIND, M). 1813 (Ohopoho): 17 km W. of Otjihu (-AC), DE WINTER & LEISTNER 5668 (PRE, WIND, M). 1913 (Sesfontein): 18 km N.W. of Sesfontein (-AB), VAN DER WALT 240 (PRE, WIND, STE). 1914 (Kamanjab): Farm Onguati (-DC), SCHWERDTFEGER 178 (WIND). 1915 (Okaukuejo): Farm Otjitambe (-CC), WALTER 1029 (WIND). 2015 (Otjihorongo): Sorris-Sorris (-CC), VAN DER WALT 232 (PRE, WIND, STE). 2016 (Otjiwarongo): Farm Moselle (-BC), WALTER 1077 (WIND, M). 2114 (UIS): 54 km W. of Uis (-AB), VAN DER WALT 215 (PRE, WIND, STE); near Brandberg (-BA), DE WINTER 3147 (PRE, WIND); Tsisab Ravine Brandberg (-BA), VAN DER WALT 227A (PRE, WIND, STE); NORDENSTAM 2455 (M); near Uis (-BB), VAN DER WALT 220 (PRE, WIND, STE). 2115 (Karibib): Spitskoppie (-CC), DE WINTER & HARDY 8094 (WIND, M); Black Range (-CC), VAN DER WALT 206 (PRE, WIND, STE); near Karibib (-DD), WERDERMANN & OBERDIECK 2415 (PRE); SEYDEL 1216 (M). 2215 (Trekkopje): Farm Onanis (-DC), GIESS, VOLK & BLEISSNER 5727 (M). 2315 (Rostock): Farm Schlesien (-BD), MERXMÜLLER & GIESS 928 (PRE, WIND, M); 48 km N.W. of Solitaire (-DB), VAN DER WALT 269 (PRE, WIND, STE, M).

(see fig. 6)

7. Commiphora giessii J.J.A. v.d. Walt in Dinteria 9: 23-28, fig. 1-5 (1973); in Madoqua ser. 1, 8: 11, t. 14-16 (1974), Type: S. W. A., near Sesfontein, VAN DER WALT 242



(PRE, holo.; WIND, STE, M).

Dioecious shrub 1,5-3 m tall, many stems of ca. 2,5 cm in diameter sprouting forth from ground level, bark reddish-brown and usually not peeling, young branchlets glabrous, very slender, often drooping, not spine-tipped. Leaves trifoliolate, glabrous, petiole 0,5-2,5 cm long, leaflets elliptic to narrowly obovate, petiolules less than 1 mm long, margin entire, apex acute or obtuse, base cuneate, terminal leaflet (1-) 2 (-4,5) x (0,5) 1 (-2,5) cm, lateral leaflets (1-) 1,5 (-3,5) x (0,5-) 0,7 (-1,5) cm. Inflorescence reduced cymes, glabrous, or flowers borne solitary. Flowers unisexual, hypogynous, subsessile, glabrous, disc 4-lobed, not adnate to perianth, stamens 8. Fruit irregularly obovoid or subglobose, ca. 6 x 5 x 5 mm, glabrous, putamen slightly rugose, with a prominent hump on upper half of less convex face, pseudo-aril reddish, with 4 thin arms of equal length reaching almost to apex of putamen.

1812 (Sanitatas): between Otjikongo and Sanitatas (-BB), MERX-MÜLLER & GIESS 1445 (M); Mountain Pass 3 km W. of waterhole Okonjombo (-BD), GIESS & LEIPPERT 7418 (WIND, M), 1913 (Sesfontein): 23 km N.W. of Sesfontein on Purros road (-AB), VAN DER WALT 242 (PRE, WIND, STE, M); 16 km N.W. of Sesfontein on Purros road (-AB), DE WINTER & LEISTNER 5713 & 5869 (PRE, M).

(see fig. 7).

8. Commiphora mollis (Oliv.) Engl. in A. DC., Monogr. Phan. 4: 23 (1883); Merxm., Prod. Fl. S.W. Afr. 23: 70: 7 (1968); J.J.A. v.d. Walt in Bothalia 11, 1 & 2: 73, fig. 39-44 (1973). Type: Mozambique, Chiramba, between Tete and coast, KIRK s.n. (K, holo.!).

- = *Balsamodendrum molle* Oliv.
- = *Balsamea mollis* (Oliv.) Engl.
- = *Commiphora welwitschii* Engl.
- = *C. cinerea* Engl.
- = *C. stuhlmannii* Engl.
- = *C. dekindtiana* Engl.
- = *C. heterophylla* Engl.
- = *C. montana* Engl.
- = *C. krausei* Engl.

- = *C. iringensis* Engl.
- = *C. boehmii* Engl.
- = *C. ndemfi* Engl.

Diocious tree 3-8 m tall with a single trunk, bark brown to greyish-green, usually peeling in thick discs, young branchlets sparsely pilose to densely pubescent, not spine-tipped. Leaves pinnate, 2-6-jugate, occasionally trifoliolate, sparsely pilose to tomentose, greyish-green but usually distinctly paler and more hairy below, petiole 1-3 cm long, leaflets elliptic or oblong-elliptic but terminal leaflet often obovate, (0, 7-) 2, 4 (-5, 2) x (0, 4-) 1, 1 (-3, 6) cm, sessile or subsessile but petiolule of terminal leaflet up to 1, 5 cm long, margin entire, apex acute to obtuse, base cuneate to broadly cuneate. Inflorescence simple or compound dichasial cymes up to 4 cm long, pilose to pubescent. Flowers unisexual, hypogynous, pedicel 3-8 mm long, pedicel, calyx and corolla pilose to pubescent, disc 4-lobed, not adnate to perianth, stamens 8. Fruit subglobose, 1, 5 x 1, 3 x 1, 3 cm, pilose to pubescent, putamen smooth, pseudo-aril with 4 winged arms, 2 commissural arms reaching almost to apex of putamen, 2 facial arms shorter.

1713 (Swartbooisdrif): 15 km W. of Otjansasemo (-AD), VAN DER WALT & GIESS 295 (PRE, WIND, STE). 1714 (Ruacana Falls): 64 km W. of Tsandi (-DA), DE WINTER 3645 (PRE, WIND, M). 1715 (Odangua): near Ndola Store (-DB), DE WINTER & GIESS 7069 (PRE, WIND, M); near Ondangua (-DD), DE WINTER & GIESS 6924 (PRE, WIND, M). 1725 (Livingstone): Mpilila Island (-CC), KILLICK & LEISTNER 3406 (PRE, M). 1813 (Ohopoho): 24 km E. of Ohopoho (-BB), MERXMÜLLER & GIESS 1505 (PRE, WIND, M); Orumana (-BB), ABNER 27 (WIND, M, PRE); Okorosawe (-BB), GIBSON 86 (WIND); 10 km W. of Ohopoho (-BB), DE WINTER & LEISTNER 5240 (PRE, WIND, M); near Ohopoho (-BB), GIBSON 195 (WIND). 1814 (Otjitundua): 32 km N. E. of Ohopoho (-AA), VAN DER WALT & GIESS 282 (PRE, WIND, STE); 56 km N. of Otjovasandu (-CD), VAN DER WALT & GIESS 276 (PRE, WIND, STE). 1914 (Kamanjab): Otjovasandu (-AB), JOUBERT 126 (WIND); Farm Ondaure (-BC), SCHWERDTFEGER 1/184 (WIND). 1915 (Okaukuejo): Otjitambe (-CC), WALTER 1027 (WIND). 1916 (Gobaub): Farm Zukov (-DA), DE WINTER 3020 (PRE, WIND, M). 2015 (Otjihorongo): between Fransfontein and Outjo (-AB), TÖLKEN & HARDY 854 (PRE, WIND); Farm Pamela (-AB), GIESS, VOLK & BLEISSNER 6098 (WIND). 2016 (Otjiwarongo): 7 km N. W. of Outjo (-AA), VAN DER



WALT 237 (PRE, WIND, STE); 15 km N. of Outjo (-AA), GIESS & MULLER 11801 (WIND, STE); 16 km from Outjo (-AA), LIEBENBERG 4916 (PRE, WIND); near Outjo (-AA), MERXMÜLLER & GIESS 1292 (PRE, WIND, M); Farm Arubus Ost (-AB); TÖLKEN & HARDY 880 (PRE, WIND); Farm Omatjenne (-AD), WALTER 996 (WIND); 35 km E. of Otjiwarongo (-DB), DE WINTER 2760 (PRE, WIND, M). 2017 (Waterberg): Farm Okawaka (-CA), GIESS, VOLK & BLEISSNER 6626 (WIND, M); Okosongomingo (-CA), VOLK 2737 (M).

(see fig. 8).

9. *Commiphora multijuga* (Hiern) K. Schum. in Just's bot. Jber. 27, 1: 480 (1901); Exell & Mendonça in Consp. Fl. Angol. 1, 2: 302 (1951); Wild in Bol. Soc. Brot. ser. 2, 33: 83 (1959); Mendes in Bol. Soc. Brot. 2, 39: 129 (1965); Merxm., Prod. Fl. S.W. Afr. 23: 70: 7 (1968); Grandvaux Barbosa, Carta Fito-geografica Angola: 195, 250 (1970); J. J. A. v. d. Walt in Madoqua ser. 1, 8: 15, t. 24-26 (1974). Type: Angola, Mossamedes, between Cazimba and Pomangala, WELWITSCH 4503 (BM, holo.!, LISU!).

Dioecious tree 3-8 m tall, usually with a single trunk, bark reddish-grey to dark grey, smooth, not peeling but in some cases cracked on old trunks, young branchlets sparsely pubescent or pubescent. Leaves pinnate, 4-10-jugate, sparsely pubescent or almost glabrous, petiole 1,5-4 cm long, slender, leaflets asymmetrically elliptic, broadly elliptic or rotund but abruptly acuminate at both ends, (1, 2-) 1, 8 (-2, 5) x (1-) 1, 3 (-2) cm, petiolules 0, 5-1, 5 cm long, slender, margin entire, apex acute, base cuneate. Inflorescence simple or compound dichasial cymes or thyrsoid up to 5 cm long, glabrous or sparsely pubescent. Flowers unisexual, perigynous, pedicel 1-4 mm long, pedicel and calyx glabrous or sparsely pubescent, petals conspicuously recurved, disc 4-lobed, upper part of lobes free but lower part adnate to hypanthium, stamens 8 (fig. 27 a & a<sub>1</sub>). Fruit subglobose, ca. 1, 5 x 1, 5 x 1, 4 cm, glabrous, putamen smooth, pseudo-aril red, cupular with 4 arms of equal length reaching almost to apex of putamen (fig. 19 c & c<sub>1</sub>).

1713 (Swartbooisdrif): 17 km S. of Epupa Falls (-AA), GIESS 9347 (WIND); 17, 5 km from Kunene River near Swartbooisdrif (-BD), MERXMÜLLER & GIESS 30499 (M). 1714 (Ruacana Falls): near Ruacana Falls (-AC), DE WINTER & GIESS 7102 (PRE, WIND),

G, M, Z); RODIN 9196 (M). 1813 (Ohopoho): 27 km W. of Kaoko-Otavi (-AB), VAN DER WALT & GIESS 297 (PRE, WIND, STE); 11 km W. of Ohopoho (-BB), DE WINTER & LEISTNER 5233 (PRE, WIND, M); Okarosawe (-BB), MERXMÜLLER & GIESS 1383 (PRE, WIND, M); 4 km N. of Ohopoho (-BB), VAN DER WALT & GIESS 286 (PRE, WIND, STE). 1913 (Sesfontein): 23 km N.W. of Sesfontein (-AB), VAN DER WALT 245 (PRE, WIND, STE). 1914 (Kamanjab): N.W. of Kamanjab (-DB), VAN NIEKERK A187B (PRE); Farm Franken (-DB), WALTER 1/39 (M); 22 km S. of Kamanjab (-DD), VAN DER WALT 257 (PRE, WIND, STE); 39 km S. of Kamanjab on Farm Blydskap (-DD), DE WINTER 3107 (PRE). 2014 (Welwitschia): 38 km W. of Welwitschia (-BC), DE WINTER & HARDY 8133 (WIND, M); near Petrified Forest (-BC), KRÄUSEL 626 (M). 2015 (Otjihorongo): 56 km S.E. of Kamanjab (-AA), VAN DER WALT 259 (PRE, WIND, STE).

(see fig. 9).

10. *Commiphora mossambicensis* (Oliv.)

Engl. in A.D.C., Monogr. Phan. 4: 26 (1883); Sim, For. Fl. P.E. Afr.: 29 (1909); Wild in Bol. Soc. Brot. ser. 2, 33: 86 (1959); White, For. Fl. N. Rhod.: 176, fig. 34 B (1962); Wild in Fl. Zamb. 2, 1: 274, t. 51 fig. C (1963). Type: Malawi, Shire River, KIRK s.n. (K, holo.!).

*Protium ? mossambicense* Oliv. in Fl. Trop. Afr. 1: 329 (1868).

*Commiphora fischeri* Engl. in Bot. Jahrb. 15: 97 (1893); Bot. Jahrb. 48: 471, fig. 1L-Lb (1912); Pflanzenfam. ed. 2, 19a: 435 (1931); Miller in J.S. Afr. Bot. 18: 38 (1952). Type: Tanzania, sine loc, FISCHER 131 (B, holo. †; K, fragment!).

*Commiphora stolzii* Engl. in Bot. Jahrb. 54: 292 (1917); Pflanzenfam. ed. 2, 19a: 435, fig. 203 (1931); Miller in J. S. Afr. Bot. 18: 39 (1952). Type: Tanzania, Kyimbila, STOLZ 1725 (B, holo. †; Z!, K!, BM!).

Dioecious tree 3-10 m tall, bark grey, smooth, not peeling, young branchlets sparsely pilose to densely pubescent with hairs and golden glandular hairs, not spine-tipped. Leaves trifoliolate or more rarely pinnate (2-jugate), sparsely pilose to densely pubescent with hairs and golden glandular hairs, bright green, petiole

5-8 cm long, leaflets ovate, broadly ovate, suborbicular or oblate, 1,5-7 x 1-8,5 cm, petiolules 0,2-1 cm long, margin entire, apex often abruptly acuminate, base truncate. Inflorescence thyrsoid up to 7 cm long, sparsely pilose to densely pubescent with hairs and golden glandular hairs. Flowers unisexual, perigynous, pedicel 1-2 mm, pedicel, calyx and corolla sparsely pilose to densely pubescent with hairs and golden glandular hairs, disc with 4 large and 4 small lobes, upper part of lobes free and lower part adnate to hypanthium, stamens 8. Fruit subglobose, ca. 1,2 x 1,1 x 0,8 cm sparsely pilose, putamen smooth, pseudo-aril with 2 commissural arms reaching almost to apex of putamen and 2 facial arms reaching 3/4 upwards.

1725 (Livingstone): Mpilila Island (-CC), KILLICK & LEISTNER 3365 (PRE, K).

(see fig. 10).

This species is also recorded from Botswana, Rhodesia, Zambia, Malawi, Mozambique, Tanzania and Kenya.

11. Commiphora dinteri Engl. in Bot. Jahrb. 44: 151 (1910); Bot. Jahrb. 48: 482 (1912); Pflanzenfam. ed. 2, 19a: 438 (1931); Wild in Bol. Soc. Brot. ser. 2, 33: 92 (1959); De Wint. in Trees S. Afr. 20, 1: 10 (1968); Merxm., Prod. Fl. S. W. Afr. 23:70: 6 (1968); J. J. A. v. d. Walt in Madoqua ser. 1, 8: 9, t. 7-10 (1974). Syntypes: S. W. A., Omalako, DINTER 1393 (B, †); sine loc, DINTER 1477 (B, †; Z!, K, fragment!).

Dioecious shrub 0,5-3 m tall, many relatively thin stems sprouting forth from ground level, bark yellowish-green to greyish-brown with dark spots, smooth, not peeling, young branchlets glabrous, usually slender, not spine-tipped. Leaves trifoliolate, glabrous, green, petiole 0,2-1,8 cm long, leaflets obovate or broadly elliptic; subsessile, margin usually finely crenate-serrate, apex obtuse seldom truncate or retuse, base cuneate, terminal leaflet (0,6-) 1,4 (-2,2) x (0,4-) 1 (-1,5) cm, lateral leaflets (0,4-) 0,9 (-1,2) x (0,2-) 0,6 (-0,9) cm. Inflorescence: flowers borne solitary. Flowers unisexual, perigynous, subsessile, calyx glandular otherwise glabrous, disc 4-lobed, adnate to hypanthium, stamens 8 (fig. 28 c & c<sub>1</sub>). Fruit ovoid, ca. 1,1 x 0,8 x 0,8 cm, apiculate, glabrous, putamen smooth, pseudo-aril red, cupular with 4 (3) arms, 2 commissural arms reaching almost to apex of

putamen, facial arms much shorter, arm on more convex face of putamen often completely undeveloped (fig. 29 d & d<sub>1</sub>).

1812 (Sanitatas): 32 km W. of Orupemba (-AB), GIESS 9402 (WIND). 2115 (Karibib): Black Range (-CC), VAN DER WALT 207 (PRE, WIND, STE); 16 km W. of Usakos (-CD), DE WINTER 6035 (PRE, WIND, M); 3 km W. of Karibib (-DD), VAN DER WALT 201 (PRE, WIND, STE), Marmorberg near Karibib (-DD), SEYDEL 1267 (M). 2215 (Trekkoepje): Road to Okongava (-BB), KINGES 3318 (M); Farm Nudis (-BC), WALTER 1182 (WIND); SEYDEL 178 (M). 2316 (Nauchas): Farm Djab (-AC), WALTER 4482 (M); Gamsberg Plateau (-AD), MERXMÜLLER & GIESS 935 (PRE, WIND, M); Farm Weissenfels (-AD), WALTER 1980 (WIND, M); Weener (-AD), VOLK 11493 (M). 2317 (Rehoboth): near Rehoboth (-AC), STREY 2612 (PRE). 2416 (Maltahöhe): Bullsport (-AB), REHM s. n. (M); Farm Friedland (-CB), WALTER 1980 (WIND); Zaris Mountains (-CD), BASSON 204 (PRE); VAN DER WALT 267 (PRE, WIND, STE). 2516 (Helmeringhausen): Farm Duwisib (-BC), VOLK 12659 & 12694 (M).

(see fig. 11).

The leaves of the specimen collected in the northern part of the Kaokoveld (GIESS 9402), are relatively large. Exceptionally large leaves of other species of *Commiphora* are also known from this part of the Kaokoveld.

12. *Commiphora gracilifrondosa* Dinter ex J. J. A. v. d. Walt in J. S. Afr. Bot. 37, 3: 190 (1971); in Bothalia 11,1&2: 95, fig. 94-99 (1973). Type: S.W.A., Warmbad, near Auros, DINTER 5124 (BOL, holo.; S!, K!, B, †).

Dioecious shrub-like tree 1-3 m tall, trunk branches above ground level into thick succose appearing stems, bark reddish-brown with dark spots, not peeling, young branchlets glabrous, slender, not spine-tipped. Leaves trifoliolate with the terminal leaflet often irregularly lobed, glabrous, green, petiole 0,4-2 cm long, leaflets linear to cultrate but very variable in size and form, sessile or subsessile, margin irregularly and rather coarsely dentate-serrate, apex obtuse to acute, base cuneate, terminal leaflet (1,5-) 2,5 (-4,5) x (0,1) 0,15 (-0,2) cm, lateral leaflets (0,7-) 2 (-3,5) x (0,1-) 0,1 (-0,2) cm. Inflorescence dichasial cymes up to 5 cm long, sparsely glandular, or flowers borne solitary. Flowers unisexual, perigynous,

pedicel 1-4 mm long, pedicel, calyx and hypanthium sparsely glandular, disc 4-lobed, adnate to hypanthium, stamens only 4. Fruit subglobose to ellipsoid, ca. 1 x 0,8 x 0,7 cm, glabrous, putamen smooth, pseudo-aril cupular with 2 long commissural arms, covering the lower 1/4 of more convex face of putamen and 1/2 of the other face.

2818 (Warmbad): Auros (-DA), DINTER 5124 (BOL, S, K). 2819 (Ariamsvléi): Farm Velloorsdrift (-CB), GIESS, VOLK & BLEISSNER 7047 (PRE, WIND, M); Onseepkans (-CB), VAN DER WALT 303 (PRE, WIND, STE, M).

(see fig. 12).

13. Commiphora oblanceolata Schinz in Bull. Herb. Boiss. ser. 2, 8: 633 (1908); Engl., Bot. Jahrb. 48: 459 (1912); Pflanzenfam. ed. 2, 19a: 435 (1931); De Wint. in Trees S. Afr. 20, 1: 16 (1968); Merxm., Prod. Fl. S.W. Afr. 23:70: 7 (1968); J. J. A. v. d. Walt in J. S. Afr. Bot. 37, 3: 196 (1971); in Madoqua ser. 1, 8: 16, t. 27-29 (1974). Type: S.W.A. Kaokoveld, Kan-Tal, DINTER 1497 (Z, holo.!, K!, W!).

Dioecious shrub-like tree, 1-3 m tall, trunk branches above ground level into thick succose appearing stems, bark grey to dark grey, smooth, not peeling, young branchlets glandular but otherwise glabrous, not spine-tipped. Leaves trifoliolate, glandular, green, petiole 0,3-2,5 cm long, leaflets narrowly oblanceolate, to oblanceolate, (0,7-) 1,3 (-4,5) x (0,3-) 0,4 (-0,9) cm, sessile or subsessile, margin finely serrate-dentate or almost entire, apex obtuse, base cuneate. Inflorescence simple dichasial cymes up to 1 cm long, glandular, or flowers borne solitary. Flowers unisexual, perigynous, pedicel 0,4-1 mm long, pedicel and calyx sparsely glandular, disc 4-lobed, adnate to hypanthium, stamens 4 only. Fruit subglobose, ca. 9 x 8 x 8 mm, glabrous, putamen and pseudo-aril not seen.

1713 (Swartbooisdrif): between Swartbooisdrif and Epupa (-BA), RYCROFT 2490 (WIND, M); 5 km N.W. of Enyandi (-BA), MERXMÜLLER & GIESS 30537 (M); 16 km W. of Enyandi (-BA), GIESS 9342 (WIND, M). 2014 (Welwitschia): near Welwitschia (-BD), GALPIN & PEARSON 1536 (BOL); PEARSON 4149 (BOL). 2214 (Swakopmund): Farm Palmenhorst (-DB), VAN DER WALT 272 (PRE, WIND, STE, M); MERXMÜLLER & GIESS 1751 (PRE, WIND, M);

KERS 1122 (WIND). 2314 (Sandwich Harbour): E. of Welwitschia Flats (- ), JENSEN 320 (PRE).

(see fig. 13).

14. Commiphora namaensis Schinz in Bull. Herb. Boiss. 2, 8: 633 (1908); Merxm., Prod. Fl. S.W. Afr. 23: 70: 7 (1968); J. J. A. v. d. Walt in Bothalia 11, 1&2: 92, fig. 88-93 (1973). Type: S.W.A., Inachab, DINTER 958 (Z, holo.!, M, fragment!).

= Commiphora rotundifolia Dinter & Engl.

Dioecious shrub-like tree 0,5-3 m tall, trunk branches above ground level into many relatively thin stems, bark light grey, not peeling, young branchlets glabrous, not spine-tipped. Leaves simple but on long shoots occasionally trifoliate with lateral leaflets 1/4 - 1/3 size of terminal leaflet, glabrous, green, petiole 3-7 mm long, lamina rotund or orbicular, (0,5-) 0,9 (-1,5) x (0,4-) 0,7 (-1,2) cm, margin serrate-dentate, apex obtuse, base cuneate. Inflorescence: flowers borne in clusters. Flowers unisexual, perigynous, subsessile, glabrous, disc 4-lobed, adnate to hypanthium, stamens 8. Fruit subglobose or ellipsoid, 1 x 0,8 x 0,7 cm, glabrous, putamen slightly rugose, pseudo-aril red, cupular with 2 commissural arms, covering the lower 1/3 of the more convex face of putamen and the lower 1/2 of the other face.

2114 (Uis): Oritsaub at Brandberg (-BA), MERXMÜLLER & GIESS 1688 (PRE, WIND, M); Uis (-BC), VAN DER WALT 223 (PRE, WIND, STE), VOLK 2689 (M). 2616 (Aus): Chamis-Süd (-BB), WALTER 2173 (M); 12 km W. of Sandverhaar (-CD), PEARSON 4637 (BOL). 2617 (Bethanie): Tschaunaup Mission (-DA), GERSTNER 6343 (PRE). 2717 (Chamaites): Farm Sunnyside (-BA), MERXMÜLLER & GIESS 2524 (WIND, M); Inachab (-BA), DINTER 958 (Z, M); Holoog (-BD), ORTENDAHL 204 (PRE); Ai-Ais (-CD), VAN DER WALT 263 & 305 (PRE, WIND, STE); Fish River Canyon (-DA), WALTER 2280 & 2258 (M); 32 km S. of Fish River Canyon (-DC), WERGER 1507 (PRE). 2719 (Tränental): Stinkdorn (-CA), DINTER 5148 (PRE, G, Z). 2817 (Violsdrif): Junction of Orange and Great Fish Rivers (-AA), PILLANS 6455 (BOL); 32 km N. of Violsdrif (-DB), VAN DER WALT 307 (PRE, WIND, STE, M). 2818 (Warmbad): Farm Norachas (-AA), GIESS, VOLK & BLEISSNER 6908



(WIND); Farm Bruinheuwel (-AC), GIESS, VOLK & BLEISSNER 6931 (WIND). 2819 (Ariamsvlei): 26 km E. of Ham River (-BA), ACOCKS 18168 (PRE); 48 km W. of Ariamsvlei (-BA), DE WINTER 3563 (WIND, M).

(see fig. 14).

This species usually has simple leaves but trifoliolate leaves were seen on long shoots of plants growing near Uis. Trifoliolate leaves and transitional forms of simple to trifoliolate leaves also developed on plants cultivated in a glass house at Stellenbosch.

15. Commiphora glaucescens Engl. in Bot. Jahrb. 10: 283 (1888); Bot. Jahrb. 48: 471 (1912); Pflanzenfam. ed. 2, 19a: 435 (1931); Exell & Mendonça in Consp. Fl. Angol. 1, 2: 302 (1951); Wild in Bol. Soc. Brot. ser. 2, 33: 92 (1959); De Wint. in Trees S. Afr. 20, 1: 12 (1968); Merxm., Prod. Fl. S.W. Afr. 23: 70: 6 (1968); J. J. A. v. d. Walt in Madoqua ser. 1, 8: 12, t. 17-20 (1974) Type: S. W. A., Usakos, MARLOTH 1306 (B, †).

Commiphora pruinosa Engl. in Bot. Jahrb. 26: 368 (1899); Bot. Jahrb. 48: 471 (1912); Pflanzenfam. ed. 2, 19a : 435 (1931). Type: S. W. A., Otyimbingue, ILSE FISCHER 168 (B, holo. †, K, fragment!, BM, sketch!).

Commiphora hereroensis Schinz in Bull. Herb. Boiss. ser. 2, 8: 632 (1908). Syntypes: S. W. A., Potmine, Ubib, FLECK 447 & 742 (Z!).

Dioecious tree 2-8 m tall with a single trunk or shrub-like tree 1-2 m tall with a trunk branching near ground level, bark yellowish-brown to reddish-brown, peeling in papery pieces or discoid flakes of the same colour, young branchlets glabrous or sparsely pilose to densely pilose, not spine-tipped. Leaves simple, glabrous or sparsely pilose to densely pilose, glaucous or pale green, subsessile, elliptic or broadly elliptic seldom obovate, (1, 5-) 4 (-10) x (0, 8-) 2, 5 (-6) cm, margin entire, apex usually truncate seldom retuse or acute, base truncate or cuneate. Inflorescence simple or compound dichasial cymes or thyrsoid up to 8 cm long, glabrous or pilose to densely pilose, often with leaf-like bracts up to 1 x 0, 7 cm. Flowers unisexual, perigynous, pedicel 2-10 mm long, pedicel, calyx and corolla glabrous or sparsely pilose to pilose, disc 8-lobed, upper part of lobes free but lower part adnate to



hypanthium, stamens 8 (fig. 28 a & a<sub>1</sub>). Fruit ellipsoid, ca. 1,1 x 0,6 x 0,4 cm, glabrous or pilose, putamen smooth, pseudo-aril red, cupular with 4 or 3 short lobes, covering lower 1/4-1/3 of putamen, 2 commissural lobes slightly longer than 2 facial lobes, lobe on more convex face of putamen in some cases undeveloped (fig. 29 e & e<sub>1</sub>).

1713 (Swartbooisdrif): 15 km W. of Otjansasemo (-AD), VAN DER WALT & GIESS 292 (PRE, WIND, STE). 1714 (Ruacana Falls): near Ruacana Falls (-AD), DE WINTER & GIESS 7103 (PRE, WIND, G, M); RODIN 9167 (M). 1813 (Ohopoho): near Ohopoho (-BB), DE WINTER & LEISTNER 5913 (PRE, M); MERXMÜLLER & GIESS 1513 (PRE, WIND, M); SMUTS & POLE EVANS 2252 (PRE, WIND, M); near Orumana (-BB), GIBSON 122 (WIND). 1814 (Otjitundua): 32 km N. E. of Ohopoho (-AA), VAN DER WALT & GIESS 280 (PRE, WIND, STE); 64 km N. of Osondeka (-CA), GIESS 9270 (WIND); 56 km N. of Otjovasandu (-CD), VAN DER WALT & GIESS 275 (PRE, WIND, STE). 1914 (Kamanjab): 27 km N. of Otjovasandu (-AB), VAN DER WALT 250 (PRE, WIND, STE); near Otjovasandu (-AD), VAN DER WALT 254 (PRE, WIND, STE); Farm Franken (-DB), SCHWERDTFEGER 1/120 (WIND). 1915 (Okaukuejo): Farm Otjitambi (-CC), WALTER 1028 (WIND). 1917 (Tsumeb): W. of Tsumeb (-BA), BOSS s. n. (M); 21 km S. of Tsumeb (BD), DE WINTER 3638 (WIND, M); near Otavi (-CB), DINTER 5276 (PRE, G); Elephantenberg (-CB), KINGES 2948 (PRE). 1918 (Grootfontein): near Grootfontein (-CA), SCHOENFELDER 58 (PRE); LE ROUX 351 (WIND). 2014 (Welwitschia): Welwitschia (-BD), GIESS, VOLK & BLEISSNER 6129 (WIND); Otjihorongo Reserve (-DD), MERXMÜLLER & GIESS 1612 (M). 2015 (Otjihorongo): 4 km S. E. of Ugab Bridge (-CC), VAN DER WALT 231 (PRE, WIND, STE). 2016 (Otjiwarongo): 7 km N. W. of Outjo (-AA), VAN DER WALT 236 & 256 (PRE, WIND, STE); Farm Graslaagte (-DB), WALTER 306 (WIND, M). 2114 (Uis): Tsibab Ravine Brandberg (-BA), VAN DER WALT 226 (PRE, WIND, STE); CARR B2 (PRE); GIESS 3687 (PRE, WIND). 2115 (Karibib): Spitskoppie (-CC), KRÄUSEL 660 (M); Farm Goabeb (-CD), GIESS, VOLK & BLEISSNER 5884 (PRE, WIND, M); Ameib (-DC), HARDY 2052 (PRE); Usakos (-DC), VOLK 122, 146 & 147 (M); near Karibib (-DD), VAN DER WALT 202 (PRE, WIND, STE); WERDERMANN & OBERDIECK 2417 (PRE); SEYDEL 1213 (M); KINGES 3635 (M). 2215 (Trekkoepje): Farm Nudis (-BC), SEYDEL 80 (M); Tinkas River, Namib Desert Park (-CD), JENSEN 208 (WIND). 2216 (Otjimbingwe): 35 km S. of Otjimbingwe (-CA), DE WINTER 2638 (PRE, WIND, M). 2314 (Sandwich Harbour): E. of

Hotsas (-B), JENSEN 83 (PRE). 2316 (Nauchas): Farm Djab (-AB), GIESS & HÜBSCH 11608 (WIND); MERXMÜLLER & GIESS 909 (PRE, WIND, M); SCHWERDTFEGER 4289 (WIND); WALTER 4289, 4481 & 4483 (M). 2415 (Sossusvlei): 18 km S. of Solitaire (-BB), VAN DER WALT 268 (PRE, WIND, STE). 2416 (Maltahöhe): Mountain Zebra Park (-AA), BENSELER s. n. (WIND); Swartpoort (-AB), VAN DER WESTHUIZEN 48 (WIND); Farm Bullspoor (-AB), HARDY 1970 (WIND); Farm Friedland (-CB), WALTER 2098 (WIND, M).

(see fig. 15).

The holotype of *C. glaucescens* (MARLOTH 1306) was destroyed in Berlin and apparently no isotypes exist because none could be traced in any South African or European herbarium.

16. *Commiphora anacardiifolia* Dinter & Engl. in Bot. Jahrb. 48: 475, fig. 2B-Bb (1912); Engl. Pflanzenfam. ed. 2, 19a: 435 (1931); Wild in Bol. Soc. Brot. ser. 2, 33: 92 (1959); Mendes in Bol. Soc. Brot. ser. 2, 39: 128 (1965); De Wint. in Trees S. Afr. 20, 1: 8 (1968); Merxm., Prod. Fl. S. W. Afr. 23:70:5 (1968); Grandvaux Barbosa, Carta Fitogeografica Angola: 195, 256 (1970); J. J. A. v. d. Walt in Madoqua ser. 1, 8: 7, t. 1-3 (1974). Type: S. W. A., Haobes, DINTER 1492 (B, holo. †, K, fragment and photo of holo. †, BM, sketch of holo. †).

Dioecious tree 5-10 m tall with a single trunk, bark yellowish-brown, peeling in large papery pieces of the same colour, young branchlets pilose, obtuse. Leaves simple, pilose, dark green, sessile or subsessile, exceptionally large (7-) 13 (-20) x (3-) 8 (-14) cm, narrowly elliptic to broadly elliptic, midrib prominent, margin entire, apex obtuse, base cuneate. Inflorescence thyrsoid up to 20 cm long, many flowered, pilose. Flowers unisexual, perigynous, pedicel 2-4 mm long, pedicel, calyx and corolla sparsely pilose or pilose, disc 8-lobed, upper part of lobes free but lower part adnate to hypanthium, stamens 8. Fruit ovoid or obovoid, ca. 1,5 x 1,1 x 1 cm, glabrous, putamen smooth, pseudo-aril yellow to orange, cupular with 4 short lobes, covering lower 1/4-1/3 of putamen (fig. 29 f & f<sub>1</sub>).

1812 (Sanitatas): 9,5 km E. of Omutati (-DB), GIESS & LEIPPERT 7401 (WIND, M). 1813 (Ohopoho): 17 km W. of Otju (-AC), DE WINTER & LEISTNER 5671 (PRE, WIND, M); MERXMÜLLER & GIESS 1434 (WIND, M). 1913 (Sesfontein): 37 km E. of Sesfontein

on Otjovasandu road (-BD), VAN DER WALT 246 (PRE, WIND, STE). 1914 (Kamanjab): near Kowares (-AB), ESTERHUYSE 402 (WIND). 2014 (Welwitschia): 138 km E. of Torra Bay (-AC), DE WINTER & HARDY 8203 (PRE, WIND, M); Twyfelfontein (-CB), MEYER 1150 (WIND, M).

(see fig. 16).

17. Commiphora wildii Merxm. Mitt. Bot. München 3: 609 (1960); Prod. Fl. S. W. Afr. 23:70:9 (1968); De Wint. in Trees S. Afr. 20, 1: 18 (1968); J. J. A. v. d. Walt in Madoqua ser. 1, 8: 21, t. 37-39 (1974). Type: S. W. A. Kaokoveld, W. of Sanitatas, MERXMÜLLER & GIESS 1453 (M, holo.!, PRE!).

Dioecious shrub-like tree 1-2, 5 m tall, trunk branches above ground level into relatively thick stems, bark grey-brown, shiny, smooth, occasionally peeling in papery strips, young branchlets pubescent to densely pubescent, often very short and stout. Leaves pinnately lobed or divided, (1-) -2-4-jugate, pubescent to densely pubescent, glaucous, petiole 0, 3-1, 5 cm long, leaflets usually asymmetrically obovate or elliptic, (0, 7-) 2 (-2, 5) x (0, 4-) 1 (-2) cm, sessile, acroscopic margin incised to rachis but basicopic margin decurrent along rachis, margin entire, apex obtuse or emarginate seldom acute. Inflorescence simple or compound dichasial cymes or thyrsoid up to 4 cm long, pilose to densely pilose, or flowers borne solitary. Flowers unisexual, perigynous, pedicel 2-6 mm long, pedicel, calyx and corolla sparsely pilose to densely pilose, disc 8-lobed, adnate to hypanthium, stamens 8 (fig. 27 b & b<sub>1</sub>). Fruit ovoid to subglobose, ca. 1, 1 x 1 x 0, 9 cm, puberulous, putamen smooth, pseudo-aril yellow to orange, cupular with 2-4 short lobes, commissural lobes slightly longer than facial lobes, covering lower 1/4 of putamen (fig. 29 g & g<sub>1</sub>).

1712 (Posto Velho): 20 km S. W. of Otjinungua (-AD), GIESS 8922 (PRE, WIND, M); 24 km S. of Ongutu (-CD), GIESS 9400 (WIND). 1812 (Sanitatas): 78 km W. of Otjihu (-BA), DE WINTER & LEISTNER 5712 (PRE, WIND, M); near Sanitatas (-BA), MERXMÜLLER & GIESS 1453 (WIND, M); Sarusas (-CD), GIESS & LEIPPERT 7468 (PRE, WIND, M). 1913 (Sesfontein): 23 km N. W. of Sesfontein (-AB), VAN DER WALT 244 (PRE, WIND, STE). 2013 (Unjab Mouth): 44 km E. of Torra Bay (-AD), DE WINTER & HARDY 8170 (WIND, M); 8 km W. of Farm Wereldend (-BB), GIESS, VOLK & BLEISSNER 6170 (WIND, M); Farm Wereldend (-BB), MERXMÜLLER & GIESS 30608

(M). 2014 (Welwitschia): 90 km W. of Welwitschia (-AC), DE WINTER & HARDY 8148 (PRE, M); Farm Bethanis (-AD), GIESS, VOLK & BLEISSNER 6148 (WIND, M). 2114 (Uis): 11 km E. of Brandberg West (-AA), VAN DER WALT 213 (PRE, WIND, STE); Numas Ravine Brandberg (-AB), GIESS 3589 (PRE, WIND); DE WINTER & HARDY 8220 (M); Messum Mountains (-AC), GIESS 9159 (PRE, WIND, M); S. of Brandberg (-BA), GIESS 9714 (M); 33 km W. of Uis (-BA), VAN DER WALT 217 (PRE, WIND, STE); near Uis (-BB), VAN DER WALT 224 (PRE, WIND, STE); Farm Sorrento (-DB), DE WINTER 6030 (WIND).

(see fig. 17).

18. Commiphora edulis (Klotzsch) Engl. in A. DC., Monogr. Phan. 4: 22 (1883); J. J. A. v. d. Walt in Bothalia 11, 1 & 2: 81, fig. 57-62 (1973). Type: Mozambique, Sena, PETERS s.n. (B, holo, †, K!).

= *Hitzeria edulis* Klotzsch.

= *Commiphora chlorocarpa* Engl.

Dioecious many-stemmed shrub or small tree 2-6 m tall, bark light grey, smooth or flaking in small yellowish papery pieces, young branchlets densely pubescent, obtuse. Leaves pinnate, 2-6-jugate, pubescent, but scabrous above, greyish green, petiole 3-8 cm long, with medullary vascular bundles, leaflets narrowly elliptic to narrowly ovate, (3-) 5 (-6, 5) x (2-) 2, 2 (-3) cm, petiolules 0, 4-1 cm long, margin usually entire seldom finely crenate-serrate, apex acute or rounded, base obtuse. Inflorescence compound dichasial cymes or thyrsoid up to 15 cm long, pubescent. Flowers unisexual, perigynous, pedicel 1-1, 5 mm long, pedicel calyx and hypanthium pubescent, disc much reduced without distinct lobes, adnate to hypanthium, stamens 8. Fruit subglobose, ca. 2, 4 x 2, 3 x 2, 3 cm, pilose, putamen smooth, pseudo-aril red, cupular with 4 short lobes, covering lower 1/3 of putamen.

1725 (Livingstone): Mpilila Island (-CC), KILLICK & LEISTNER 3373 (PRE, M); KILLICK & LEISTNER 3337 (M).

(see fig. 18).

GILLETT (1973) pointed out that the type description of *Hitzeria edulis* Klotzsch is based on discordant elements. The description of the female flowers and fruit is not that of a *Commiphora* but presumably that of a member of the Anacardiaceae. It will never be known whether the holotype which was destroyed in Berlin, consisted of discordant elements. The isotype at Kew, however, consists of only one taxon and this is definitely the same as *C. edulis* occurring in Southern Africa. It is suggested that the name *C. edulis* should be kept for the following reasons:

1. The existing isotype consists of only one taxon matching the first part of the type description.
2. It is most unlikely that the specific epithet *edulis* will ever be used for that taxon of the Anacardiaceae because the description is too undefined.

GILLETT (1973) also suggested that *C. edulis* is conspecific with *C. boiviniana* Engl. Several Kew specimens of the different subspecies of *C. boiviniana* were studied and compared with specimens of *C. edulis*. Differences in the size and shape of the leaflets exist between the subspecies of *C. boiviniana* and *C. edulis*, but the flowers and fruits have basically the same structure. Medullary vascular bundles which occur in the petiole of *C. edulis*, were also found in the petioles of all the subspecies of *C. boiviniana*. It seems likely therefore that *C. edulis* and *C. boiviniana* are conspecific, but the final decision should be left to someone who has studied them both in their natural habitat.

19. *Commiphora saxicola* Engl. in Bot. Jahrb. 10: 283 (1888); Bot. Jahrb. 48: 481, fig. 3 A-Ab (1912); Pflanzenfam. ed 2, 19a: 437 (1931); Wild in Bol. Soc. Brot. 2, 33: 92 (1959); De Wint. in Trees S. Afr. 20, 1: 16 (1968); Merxm., Prod. Fl. S. W. Afr. 23:70:8 (1968); J. J. A. v. d. Walt in Madoqua ser. 1, 8: 18, t. 30-33 (1974). Type: S. W. A., Walvis Bay, MARLOTH 1221 (B, holo. †, PRE!).

*Commiphora dulcis* Engl. in Bot. Jahrb. 19: 141 (1894). Type: S. W. A., Tsoachoub near Husab, GÜRICH 6 (?).

Dioecious shrub-like tree or small tree 0, 2-4 m tall with trunk 0, 1-1, 5 m long, bark grey, finely pitted, smooth, not peeling, young



branchlets with glandular hairs but otherwise glabrous, not spine-tipped. Leaves pinnate, 2-6-jugate, with glandular hairs but otherwise glabrous, green, petiole 0,3-3,5 cm, leaflets suborbicular to obovate, (0,3-) 1,2 (-1,7) x (0,3) 1,2 (-1,7) cm, petiolules less than 1 mm, margin rather coarsely crenate-serrate, apex emarginate or truncate, base cuneate or truncate. Inflorescence raceme or thyrsoid up to 6 cm long, with glandular hairs. Flowers unisexual, perigynous, subsessile, pedicel, calyx, corolla and ovary with glandular hairs, disc obscurely 8-lobed, adnate to hypanthium, stamens 8 (fig. 28 b & b<sub>1</sub>). Fruit oblong-ellipsoid, ca. 1x0,6x0,6 cm, glabrous, putamen smooth, pseudo-aril orange, cupular without any lobes, covering lower 1/3 of putamen (fig. 29 h & h<sub>1</sub>).

1913 (Sesfontein): 23 km N.W. of Sesfontein (-AB), VAN DER WALT 243 (PRE, WIND, STE). 2013 (Unjab Mouth): 57 km E. of Torra Bay (-BC), DE WINTER & HARDY 8167 (WIND, M); Farm Driefontein (-BD), GIESS, VOLK & BLEISSNER 6157 (WIND, M). 2014 (Welwitschia): 45 km N. of Uis (-DD), TÖLKEN & HARDY 835 (PRE, WIND, M). 2015 (Otjhorongo): Otjhorongo Reserve (-CC), MERXMÜLLER & GIESS 1616 (WIND, M); VAN DER WALT 233 (PRE, WIND, STE); 13 km N.E. of Ossontati (-CD), GIESS, VOLK & BLEISSNER 5975 (WIND, M). 2114 (Uis): 13 km S. of Brandberg West (-AA), VAN DER WALT 212 (PRE, WIND, STE); 26 km E. of Brandberg West (-AB), VAN DER WALT 214 (PRE, WIND, STE); Numas Ravine Brandberg (-AB), GIESS 3650 (PRE, WIND, M); Messum Mountains (-AC), GIESS 9160 (WIND, M); near Brandberg (-BA), LIEBENBERG 4987 (PRE, WIND); Tsisab Ravine, Brandberg (-BA), VON WETTSTEIN 378 (M); NORDENSTAM 2456 (M); 8 km S. of Tsisab Ravine, Brandberg (-BA), GIESS 3650A (WIND); VAN DER WALT 227 (PRE, WIND, STE); CARR B3 (PRE); 13 km N. of Uis (-BB), GIESS 9170 (WIND, M); near Uis (-BB), VAN DER WALT 221 (PRE, WIND, STE). 2115 (Karibib): Ameib (-DC), DINTER 6867 (PRE, M). 2214 (Swakopmund): 56 km E. of Henties Bay (-BB), MERXMÜLLER & GIESS 1722 (M); Farm Palmenhorst (-DB), VAN DER WALT 273 (PRE, WIND, STE). 2215 (Trekopje): Trekopje (-AC), SEYDEL 1208 (PRE, M); Farm Ubib (-BA), WANNTORP 1008 (WIND). 2315 (Rostock): Farm Schlesien (-BB), MERXMÜLLER & GIESS 932 & 979 (PRE, WIND, M); 54 km N.W. of Solitaire (-DB), VAN DER WALT 270 (PRE, WIND, STE). 2316 (Nauchas): Farm Djab (-AB), MERXMÜLLER & GIESS 911 (PRE, WIND, M). 2516 (Helmeringhausen): Farm Duwisib (-BC), VOLK 12758 (M). 2616 (Aus): Farm Weissenborn (-AB), KINGES 4442 (M).

(see fig. 19).

No type specimen (GÜRICH 6) of *C. dulcis* Engl. could be traced in any herbarium. From the original description of the habit of *C. dulcis* by ENGLER, it is almost certain that it is a synonym of *C. saxicola*. This is also the view of MERXMÜLLER (1968).

20. *Commiphora crenato-serrata* Engl. in Bot. Jahrb. 19: 140 (1894); Bot. Jahrb. 48: 483 (1912); Pflanzenfam. ed. 2, 19a: 438 (1931); Wild in Bol. Soc. Brot. ser. 2, 33: 92 (1959); De Wint. in Trees S. Afr. 20, 1: 10 (1968); Merxm., Prod. Fl. S. W. Afr. 23:70:5 (1968); J. J. A. v. d. Walt in Madoqua ser. 1, 8: 8, t. 4-6 (1974). Type: S. W. A., Fransfontein, GÜRICH 71 (B, holotype, BM, sketch of holotype).

Dioecious tree 3-10 m tall with a single trunk, bark light grey to pale brown, pitted, smooth, not peeling, young branchlets with large glandular hairs but otherwise glabrous, conspicuously scarred, obtuse. Leaves pinnate, 3-7-jugate, with large glandular hairs on petiole, rachis and veins of leaflets but otherwise glabrous, green, petiole 4-8 cm long, with medullary vascular bundles, leaflets usually lanceolate seldom narrowly lanceolate, (3-) 6 (-10) x (1-) 2 (-4) cm, petiolules 0,5-2 cm long, margin crenate-serrate, apex acuminate, base truncate. Flowers not seen. Fruit ovoid, ca. 2x1x1 cm, conspicuously beaked, with a few glandular hairs, putamen smooth, pseudo-aril red, cupular with 0-4 short lobes, covering lower 1/3 - 1/2 of putamen (fig. 29 i & i<sub>1</sub>).

1713 (Swartbooisdrif): 15 km W. of Otjangosemo (-AD), VAN DER WALT & GIESS 293 (PRE, WIND, STE). 1813 (Ohopoho): 4 km N. of Ohopoho (-BB), VAN DER WALT & GIESS 285 (PRE, WIND, STE); 5 km S. of Okorosawe (-BB), VAN DER WALT & GIESS 287 (PRE, WIND, STE). 1914 (Kamanjab): 27 km N. of Otjovasandu (-AB), VAN DER WALT 249 (PRE, WIND, STE); near Otjovasandu (-AB), JOUBERT 130 (WIND); Farm Hazeldene (-BC), DE WINTER & LEISTNER 5121 (WIND, M). 1915 (Okaukuejo): Farm Teschendorf (-CC), WALTER 1011 (WIND, M). 2015 (Otjihorongo): Farm Hill-down (-AA), HARDY 2082 (PRE); VOLK 2634 (M); 23 km N. of Fransfontein (-AA), VAN DER WALT 258 (PRE, WIND, STE); Farm Pamela (-AB), GIESS, VOLK & BLEISSNER 6093 (PRE, WIND, M).

(see fig. 20).



21. Commiphora tenuipetiolata Engl. in Bot. Jahrb. 48: 483, fig. 3L (1912); Merxm., Prod. Fl. S.W. Afr. 23:70:9 (1968); J. J. A. v. d. Walt in Bothalia 11, 1&2: 87, fig. 75-81 (1968). Syntypes: S. W. A., Sesfontein, DINTER 1721 (B†, K, fragment!, BM, sketch!); S. W. A. Bullsport, DINTER 2109 (B†, K, fragment!).

Diocious tree with a single trunk 2-12 m tall, occasionally shrub-like tree with a short trunk, bark peeling in yellowish-white papery pieces to expose a blue-green underlayer or peeling in thick brownish discs, young branchlets glabrous, sparsely pilose but rarely pubescent, not spine-tipped. Leaves trifoliolate (then mostly glabrous) or pinnate, 2-4-jugate (then usually sparsely pilose to pubescent, occasionally also with glandular hairs), glaucous, yellowish-green or green, petiole 0,7-5 cm long, usually relatively thin and slender especially in trifoliolate leaves, upper 3/4 of leaflets margin crenate-serrate, lower 1/4 subentire or entire, occasionally exclusively entire, terminal leaflet elliptic, broadly elliptic or obovate, 1,2-6,5 x 0,7-3 cm, petiolule 1-4 (-12) mm long, apex acute or obtuse, base cuneate rarely obtuse, lateral leaflets elliptic to broadly elliptic rarely suborbicular, 0,6-4,5x0,4-2,5 cm, subsessile or sessile, apex acute rarely obtuse, base cuneate or obtuse. Inflorescence simple or compound dichasial cymes up to 5,5 cm long, glabrous, sparsely pilose or pubescent. Flowers unisexual, perigynous, pedicel 4-10 mm long, pedicel, hypanthium and calyx usually glabrous seldom pilose, occasionally also with glandular hairs, disc reduced without distinct lobes, adnate to hypanthium, stamens 8. Fruit subglobose, ca. 1,5x1,3x1 cm, glabrous, pseudo-aril cupular with 2 facial lobes of variable length and form, covering lower 1/3-3/4 of putamen, lobe on less convex face of putamen usually longer and larger than other lobe (fig. 29 j & j<sub>1</sub>).

1713 (Swartbooisdrif): 13 km E. of Epembe (-DA), VAN DER WALT & GIESS 289 (PRE, WIND, STE). 1718 (Kuringkuru): 17 km W. of Kuringkuru (-DA), DE WINTER 3943 (PRE, WIND, M). 1813 (Ohopoho): Okasorowe (-AD), MERXMÜLLER & GIESS 1433 (PRE, WIND, M); 10 km W. of Ohopoho (-BB), DE WINTER & LEISTNER 5241 (PRE, WIND, M); 6 km N. of Ohopoho (-BB), DE WINTER & LEISTNER 5253 (PRE, WIND, M); 4 km N. of Ohopoho (-BB), VAN DER WALT & GIESS 284 (PRE, WIND, STE); 23 km W. of Kaoko-Otavi at Omungunda (-BC), VAN DER WALT & GIESS 289 (PRE, WIND, STE). 1820 (Tarikora): 6 km E. of Nyangana (-BB), DE WINTER & WISS 4189 (PRE, WIND, M). 1821 (Andara): Andara (-AB),

MERXMÜLLER & GIESS 2036 (PRE, WIND, M). 1913 (Sesfontein): 23 km N.W. of Sesfontein (-AB), VAN DER WALT 241 (PRE, WIND, STE). 1914 (Kamanjab): Kamanjab (-DB), MERXMÜLLER & GIESS 1553 (PRE, M). 1917 (Tsumeb): Tsumeb (-BA), LE ROUX 177 (PRE, WIND); Farm Nunab (-CA), DE WINTER 3004 (PRE). 1918 (Grootfontein): Okapukua (-CD), MERXMÜLLER & GIESS 1776 (M). 1920 (Tsumkwe): N. of Gautscha Pan (-DC), STORY 6438 (PRE). 2014 (Welwitschia): 46 km W. of Welwitschia (-BC), DE WINTER & HARDY 8132 (PRE, WIND); Welwitschia (-BD), GIESS, VOLK & BLEISSNER 6231 (PRE, WIND, M). 2015 (Otjhorongo): Otjhorongo Reserve (-CC), MERXMÜLLER & GIESS 1613 (PRE, WIND, M); 4 km S.E. of Ugab Bridge (-CC), VAN DER WALT 234 (PRE, WIND, STE). 2016 (Otjiwarongo): 17 km N.E. of Otjiwarongo (-BC), DE WINTER 2812 (PRE, WIND, M); 35 km S. of Otjiwarongo (-DA), DE WINTER 2761 (M). 2114 (Uis): 58 km E. of Brandberg West (-BA), VAN DER WALT 218 (PRE, WIND, STE); near Uis (-BB), VAN DER WALT 222 (PRE, WIND, STE); KINGES 3357 (PRE); GIESS 10711 (WIND); 13 km N. of Uis (-BB), GIESS 9171 (PRE, WIND, M); CARR B9 (PRE); 14 km W. of Klein Spitskoppie (-DD), VAN DER WALT 210 (PRE, WIND, STE). 2115 (Karibib): Spitskoppie (-CC), BOSS s.n. (PRE); Klein Spitskoppie (-CC), DE WINTER & HARDY 8065 (PRE, WIND, M); near Karibib (-DD), SEYDEL 1265 (PRE, M); VAN DER WALT 203 (PRE, WIND, STE); DINTER 6831 (M, Z). 2215 (Trekopje): Farm Nudis (-BC), WALTER 1291 (PRE, WIND, M). 2216 (Otjimbingwe): Farm Tsammams (-CA), DE WINTER 2637A (PRE, WIND, M). 2314 (Sandwich Harbour): Hills E. of Hotsas (- ), JENSEN 81 (PRE). 2315 (Rostock): Farm Schlesien (-BB), MERXMÜLLER & GIESS 977 (PRE, WIND, M); 64 km N.W. of Solitaire (-BD), VAN DER WALT 271 (PRE, WIND, STE). 2316 (Nauchas): Farm Djab (-AB), GIESS & HÜBSCH 11609 & 11611 (WIND); DE WINTER, LEISTNER & GIESS 9292 (PRE, WIND) MERXMÜLLER & GIESS 910 (PRE, WIND, M).

(see fig. 21).

In the Transvaal, *C. angolensis* and *C. tenuipetiolata*, are two clearly delimited species, easily distinguishable by the indumentum of the branchlets and leaves. The branchlets and leaves of *C. angolensis* are sparsely pilose to densely pubescent but those of *C. tenuipetiolata* are glabrous (Van der Walt, 1973). In this area the two species may occur together, *C. angolensis* as a many-stemmed shrub and *C. tenuipetiolata* as a tree with a single trunk.

In the past the indumentum of the branchlets and leaves was used to distinguish between these two species in South West Africa (DE WINTER, 1968; MERXMÜLLER, 1968). Following this criterium, single-boled trees up to 12 m tall, like those occurring in the hills in the vicinity of Ohopoho (DE WINTER & LEISTNER 5253), were determined as *C. angolensis*. These trees have hairy leaves, whereas the habit, whitish papery bark, glaucous stems and pseudo-aril resemble those of *C. tenuipetiolata*. On the plains near Ohopoho, grow small, many-stemmed shrubs with all the typical characters of *C. angolensis* (VAN DER WALT & GIESS 281). In my opinion these shrubs are *C. angolensis* and the trees a hairy form of *C. tenuipetiolata*.

It is interesting to note that ENGLER (1912) in his original description of *C. tenuipetiolata*, described the leaves as "utrinque costis sparse pilosis exceptis glabra". On careful examination, specimens from different localities of South West Africa, show a variable degree of hairiness, some being pubescent, others sparsely pilose or glabrous. Hairs as well as glandular hairs are usually present and some specimens show an exceptionally large number of glandular hairs (MERXMÜLLER & GIESS 1433). There is a transition between the different forms and therefore it is not advisable to recognize varieties or subspecies. On the whole the hairy forms have a northern distribution in South West Africa and the glabrous forms a more southern distribution.

Usually it is almost impossible to distinguish between *C. angolensis* and hairy forms of *C. tenuipetiolata*, using leaf characters alone. The glabrous forms of *C. tenuipetiolata* usually have trifoliolate leaves with a thin and slender petiole, whereas the hairy forms have trifoliolate or pinnate leaves with a "normal" petiole.

22. *Commiphora angolensis* Engl. in A. DC., Monogr. Phan. 4: 24 (1883); Merxm., Prod. Fl. S. W. Afr. 23:70: 5 (1968) pro parte; J. J. A. v. d. Walt in Bothalia 11, 1&2: 90, fig. 82-87 (1973). Lectotype: Angola, Luanda, WELWITSCH 4495 (LISU!).

- = *Balsamea angolensis* (Engl.) Hiern.
- = *Commiphora oliveri* Engl.
- = *C. rehmannii* Engl.
- = *C. longibracteata* Engl.

- = *C. kwebensis* N.E. Br.
- = *C. gossweileri* Engl.
- = *C. nigrescens* Engl.

Dioecious many-stemmed shrub or bush 0,5-2,5 m tall, bark grey to dark grey with brownish lenticels, often flaking locally in yellowish papery pieces, young branchlets sparsely pilose to densely pubescent, not spine-tipped. Leaves trifoliolate or pinnate, 2-4-jugate, sparsely pilose to densely pubescent, green, petiole 0,5-2,2 cm, upper 3/4 of leaflets margin crenate-serrate, lower 1/4 subentire to entire, terminal leaflet elliptic to broadly elliptic rarely obovate, (1-) 1,6 (-3,2) x (0,7-) 1 (-2) cm, petiolule 1-3 (-9) mm, apex acute rarely obtuse, base cuneate rarely obtuse, lateral leaflets elliptic to broadly elliptic rarely suborbicular, (0,5-) 1,2 (-3) x (0,4-) 0,8 (-1,8) cm, subsessile or sessile, apex acute rarely obtuse, base cuneate or obtuse. Inflorescence simple or compound dichasial cymes up to 5 cm long, sparsely pilose to densely pubescent. Flowers unisexual, perigynous, pedicel 2-5 mm long, pedicel, hypanthium, calyx and corolla sparsely pilose to densely pubescent, disc reduced without distinct lobes, adnate to hypanthium, stamens 8. Fruit subglobose or ellipsoid, ca. 1,3 x 1,1 x 0,9 cm, pilose, putamen smooth, pseudo-aril cupular with 2 facial lobes of variable length and form, covering lower 1/4-1/2 of putamen, lobe on less convex face of putamen usually longer than other lobe (fig. 29 k & k<sub>1</sub>).

1713 (Swartbooisdrif): Okavare (-DA), ABNER 3 (PRE, WIND, M). 1714 (Ruacana Falls): near beacon 4 on border (-AD), DE WINTER 3668 (PRE, WIND, M); 27 km S. of Ruacana-Oshakati road junction (-CA), VAN DER WALT & GIESS 301 (PRE, WIND, STE). 1719 (Runtu): 3 km S. of Runtu (-DD), DE WINTER 3756 (PRE, M). 1720 (Sambio): Ndonga (-CD), DE WINTER & WISS 4144 (PRE, M). 1814 (Otjitundua): 32 km N.E. of Ohopoho (-AA), VAN DER WALT & GIESS 281 (PRE, WIND, STE); 110 km N. of Otjovasandu (-AD), VAN DER WALT & GIESS 277 (PRE, WIND, STE). 1816 (Namutoni): N. of Namutoni (-DD), GIESS & SMOOK 10568 (M). 1914 (Kamanjab): 27 km N. of Otjovasandu (-AB), VAN DER WALT 251 (PRE, WIND, STE); Farm Otjovasandu (-AD), MERXMÜLLER & GIESS 1306 (PRE, WIND, M). 1915 (Okaukuejo): N.W. of Okaukuejo (-BA), GIESS, VOLK & BLEISSNER 6059 (PRE, WIND, M). 1916 (Gobaub): Farm Pierre (-DA), TÖLKEN & HARDY 893 (PRE, M). 1917 (Tsumeb): Farm Heidelberg (-BB), WALTER 352 (PRE, WIND); Otavi (-CB), DINTER 5264 (PRE, Z). 1920 (Tsumkwe): Cigarette E. of Karakuwise (-BA), MAQUIRE 2226

(PRE, WIND); 6 km E. of Tsumkwe (-DA), GIESS, WATT & SNYMAN 11032 (M); 16 km S. of Nama Pan (-DC), STORY 6280 (PRE, WIND); Tsumkwe (-DC), STORY 6110 (PRE, WIND, Z); Aha Mountains (-DD), STORY 6329 (PRE, WIND). 2019 (Eiseb): 27 km N. of Eiseb (-CA), GIESS 9800 (PRE, WIND, M); 56 km N. E. of Epata (-CC), GIESS 9742 (PRE, WIND, M). 2218 (Gobabis): Farm Breitenberg (-DC), MERXMÜLLER & GIESS 1074 (PRE, WIND, M). 2319 (Aminuis): Farm Dennegeur (-CC), CODD 5857 (PRE, WIND).

(see fig. 22).

23. Commiphora kraeuseliana Heine in Senckenberg. Biol. 37: 493, fig. 1&2 (1956); Wild in Bol. Soc. Brot. ser. 2, 33: 90 (1959). De Wint. in Trees S. Afr. 20, 1: 12 (1968); Merxm., Prod. Fl. S.W. Afr. 23:70:7 (1968); J. J. A. v. d. Walt in Madoqua ser. 1, 8: 14, t. 21-23 (1974). Type: S.W.A., Tafelberg near Petrified Forest, KRÄUSEL 634 (FR, hol.!, M!).

Dioecious shrub 1-2 m tall with many relatively thin and slender stems sprouting forth from ground level, bark greyish-brown or yellowish, peeling at the base of the stems in brownish papery pieces, young branchlets glabrous, scarred, relatively short and stout. Leaves pinnate, 6-8-jugate, glabrous, green, petiole 0,5-2,5 cm long, leaflets subacicular, (1-) 1,5 (-2,5) x 0,05-0,1 cm, sessile, margins entire. Inflorescence thyrsoid up to 6 cm long, villous, with large bracts up to 7x1 mm. Flowers unisexual, perigynous, pedicel 4-8 mm long, pedicel, calyx and corolla villose or sparsely villose, disc 8-lobed, adnate to hypanthium, stamens 8. Fruit subglobose, ca. 2x2x1,8 cm, glabrous, putamen smooth, pseudo-aril absent (fig. 29 1).

1812 (Sanitatas): Anabib near Orupembe (-BA), STORY 5729 (PRE, WIND); Orupembe (-BA), DE WINTER & LEISTNER 5733 (PRE, WIND, M); 17 km E. of Orupembe (-BD), DE WINTER & LEISTNER 5719 (PRE, WIND, M). 2013 (Unjab Mouth): Farm Driefontein (-BD), GIESS, VOLK & BLEISSNER 6156 (WIND, M). 2014 (Welwitschia): Farm Bergsig (-AA), MERXMÜLLER & GIESS 30615 (M); 8 km W. of Petrified Forest (-BC), IHLENFELDT, DE WINTER & HARDY 3194 (PRE, M); DE WINTER & HARDY 8147 (M); VAN DER WALT 260 (PRE, WIND, STE); KRÄUSEL 634 (M). Twyfelfontein (-CB), GIESS, VOLK & BLEISSNER 6213 (WIND, M). 2114 (Uis): Tsisab Ravine Brandberg (-BA), MERXMÜLLER



& GIESS 1611 (WIND, M); CARR B1 (PRE); NORDENSTAM 2458 (M); GIESS 3692 (PRE, WIND, M); MEYER 1141 & 1142 (WIND, M); LIEBENBERG 5005 (PRE, WIND); VAN DER WALT 228 & 262 (PRE, WIND, STE). Numas Ravine Brandberg (-BA), GIESS 3649 (PRE, WIND, M).

(see fig. 23).

24. Commiphora capensis (Sond.) Engl. in A. DC., Monogr. Phan. 4:18 (1883); Merxm., Prod. Fl. S.W. Afr. 23:70:5 (1968); J. J. A. v. d. Walt in Bothalia 11, 1&2: 96, fig. 100-105 (1973). Type: North-western Cape, between Natvoet and Orange River, DRÈGE 6809 (ex parte) (S, holo.!, G!, MEL, fragment!).

- = Balsamodendrum capense Sond.
- = Balsamea capensis (Sond.) Engl.
- = Commiphora rangeana Engl.
- = C. ruquetiana Dinter & Engl. Type: S.W.A., Rotkop, DINTER 1023 (B†, SAM!).

Dioecious shrub-like tree 0,5-4 m tall, trunk branches near ground level into thick succose appearing stems, bark yellowish-brown with dark patches, usually not peeling but occasionally flaking locally in small papery pieces, young branchlets glabrous, not spine-tipped. Leaves trifoliolate, glabrous, green, petiole 0,1-1 cm long, leaflets cordate, obovate or occasionally orbicular, petiolules 0,5-2 mm long, margin undulate or crenate occasionally almost entire, apex emarginate or obtuse, base cuneate seldom truncate, terminal leaflet (4-) 9 (-18) x (3-) 8 (-14) mm, lateral leaflets (3-) 6 (-13) x (2-) 5 (-10) mm. Inflorescence simple dichasial cymes up to 1 cm long, glandular, or flowers borne solitary. Flowers unisexual, perigynous, pedicel 0,5-1 mm long, calyx and hypanthium fleshy, calyx, hypanthium and corolla glandular, disc 4-lobed, adnate to hypanthium, stamens 8. Fruit ellipsoid, ca. 1,2 x 1 x 0,6 cm, glabrous, putamen smooth, pseudo-aril absent.

2615 (Lüderitz): Halenberg (-CB), MERXMÜLLER & GIESS 3113 (WIND, M); DINTER 6644 (G); KINGES 4673 (M); 32 km E. of Lüderitz (-CB), DE WINTER & HARDY 7918 (PRE, WIND, M); Kovis Mountains (-CB); RANGE 172 (BOL); GIESS 2355 (PRE, WIND, M); MERXMÜLLER & GIESS 28438 (M). 2816 (Oranjemund): Lorelei Copper Mine (-BB), DE WINTER & GIESS 6351 (PRE, WIND, M);



MERXMÜLLER & GIESS 2422 (M); 11,5 km S. E. of Rosh Pinah (-BB), MERXMÜLLER & GIESS 28674 (M).

(see fig. 24).

25. Commiphora cervifolia J.J.A. v.d. Walt in J.S. Afr. Bot. 37, 3: 189 (1971); in Bothalia 11, 1&2: 99, fig. 106-111 (1973). Type: North-Western Cape, 8 km S. of Vioolsdrif, VAN DER WALT 128 (PRE, holo., PRU).

Dioecious shrub-like tree 0,5-3 m tall, trunk branches near ground level into thick succose appearing stems, bark greyish-green to yellowish-brown with dark patches, not peeling, young branchlets glabrous, short and stout. Leaves trifoliolate, glabrous, green, petiole 2-5 mm long, leaflets cultrate or narrowly oblanceolate and usually irregularly lobed, (2-) 7 (-12) x (1-) 2 (-3) mm, sessile, margin entire irrespective of lobes, apex acute to obtuse, base cuneate. Inflorescence dichasial cymes up to 1 cm long, glandular, or flowers borne solitary. Flowers unisexual, perigynous, pedicel 1-1,5 mm long, calyx and hypanthium fleshy and glandular, disc 4-lobed, adnate to hypanthium, stamens 8. Fruit ellipsoid ca. 1,1 x 1 x 0,6 cm, glabrous, putamen smooth, pseudo-aril absent.

2717 (Chamaïtes): Ai-Ais (-CD), VAN DER WALT 306 (PRE, WIND, STE, M); 30 km N.E. of Ai-Ais (-DC), VAN DER WALT 264 & 304 (PRE, WIND, STE).

(see fig. 25).

#### POSSIBLE NEW SPECIES OF COMMIPHORA FROM SOUTH WEST AFRICA

MERXMÜLLER (1968) mentions four specimens (DE WINTER & LEISTNER 5670, DE WINTER & LEISTNER 5876, GIESS 8921 and MERXMÜLLER & GIESS 1430) which resemble *C. saxicola*, but also exhibiting certain atypical characters of this species. Duplicates of these specimens were examined, and the following deductions made:

(1) Medullary vascular bundles occur in the petioles of the specimens MERXMÜLLER & GIESS 1430 and GIESS 8921, but such bundles are lacking in the petioles of the specimens DE WINTER &

LEISTNER 5670 & 5876. It has also been determined that the petiole of *C. saxicola* is devoid of medullary vascular bundles. It can thus be concluded that the specimens MERXMÜLLER & GIESS 1430 and GIESS 8921 represent a taxon other than *C. saxicola*.

(2) The presence of medullary vascular bundles in the petioles of the specimens MERXMÜLLER & GIESS 1430 and GIESS 8921 resembles *C. crenato-serrata* which has such bundles in the petiole. MERXMÜLLER (1968) also points out that there is a similarity between the leaves of *C. crenato-serrata* and those of the specimen MERXMÜLLER & GIESS 1430. The pseudo-axil of the latter specimen, however, has two short facial lobes and no commissural lobes, and is thus not typical of *C. crenato-serrata*. More material is needed to solve this taxonomic problem.

(3) The specimens DE WINTER & LEISTNER 5670 & 5876 may be material from the same taxon. Both were collected from small trees with a grey, non-flaking bark whose leaflets were more or less of the same size, and with glandular hairs. The obvious difference between the specimens lies in the shape of the leaflets.

MENDES (1974) expressed the opinion that the specimens DE WINTER & LEISTNER 5876 and MENEZES 413 (from Angola, LISC) represent the same taxon and possibly a new species (*C. crassifoliolata* Mendes nom. prov.).

Flowers and fruits of this supposedly new species are needed to determine whether it really differs from *C. saxicola*.

MERXMÜLLER (1968) also mentions two specimens (DE WINTER & LEISTNER 5121 and GIESS, VOLK & BLEISSNER 6093) with typical and atypical characters of *C. crenato-serrata*. MENDES (1974) proposed that the specimen DE WINTER & LEISTNER 5121 and KEET 1622 (PRE) represent the same taxon and possibly a new species (*C. macrofoliolata* Mendes nom. prov.). Also in this case, it is impossible to make a final decision on the validity of this proposed new species without flowering and fruiting material.

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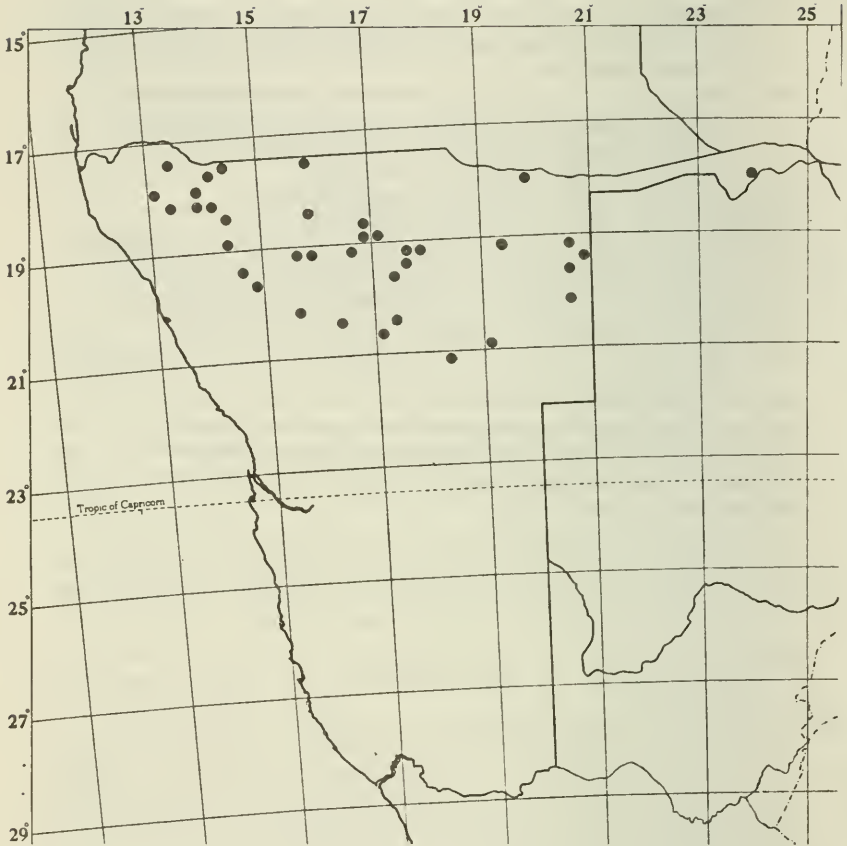


Fig. 1.  
Geographical distribution of *Commiphora africana* in South West Africa.

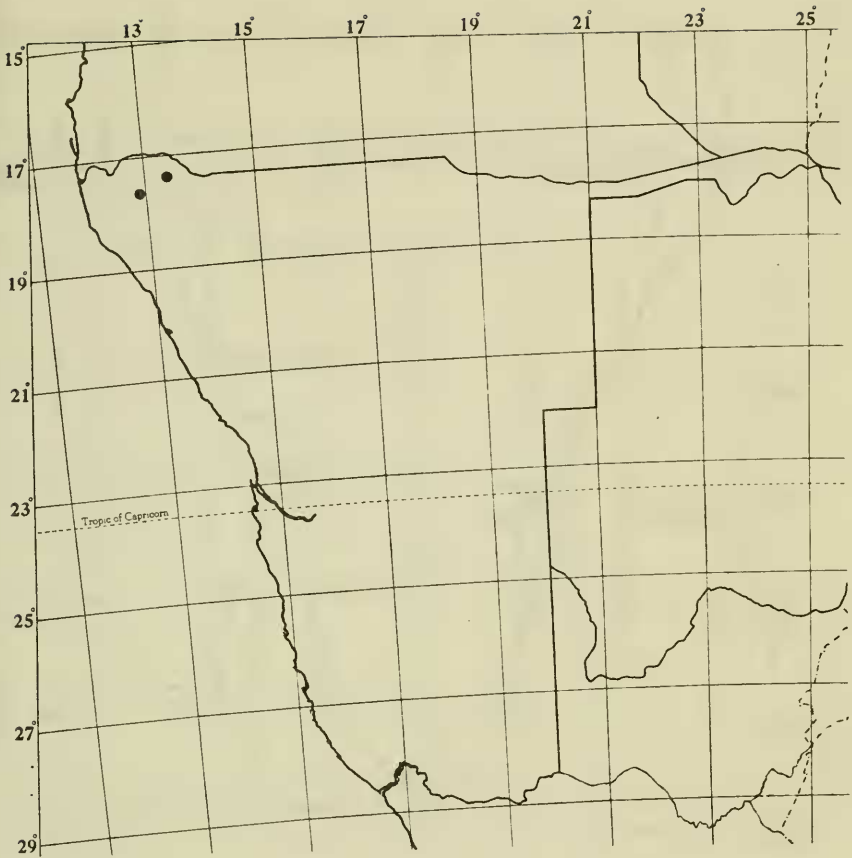


Fig. 2.  
Geographical distribution of *Commiphora discolor* in  
South West Africa.

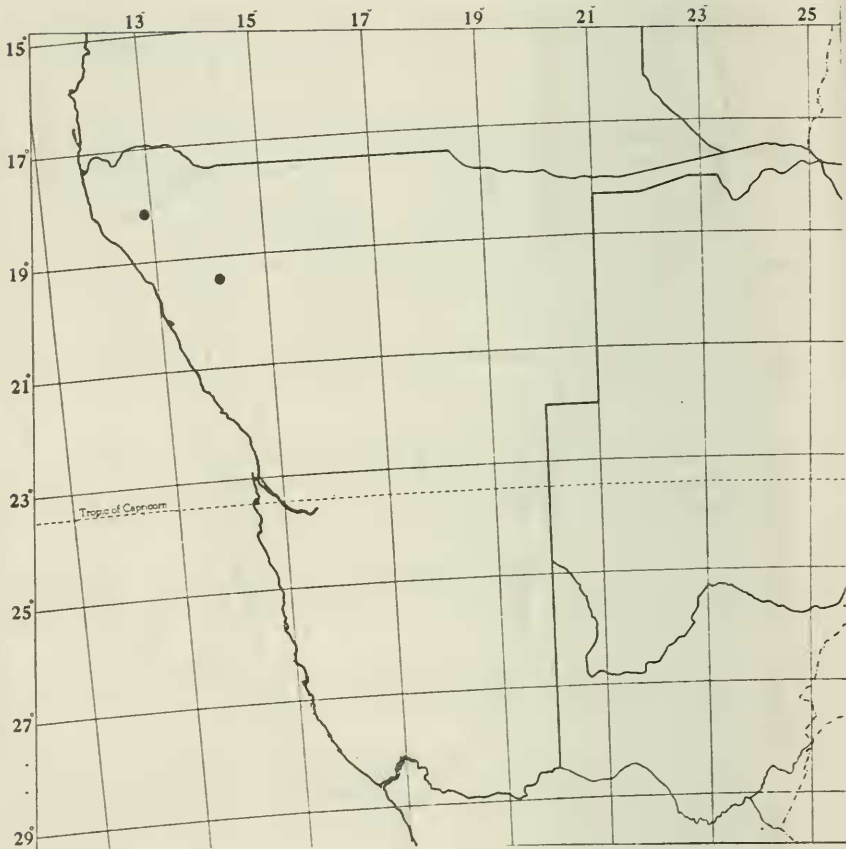


Fig. 3.  
Geographical distribution of *Commiphora merkeri* in South West Africa.



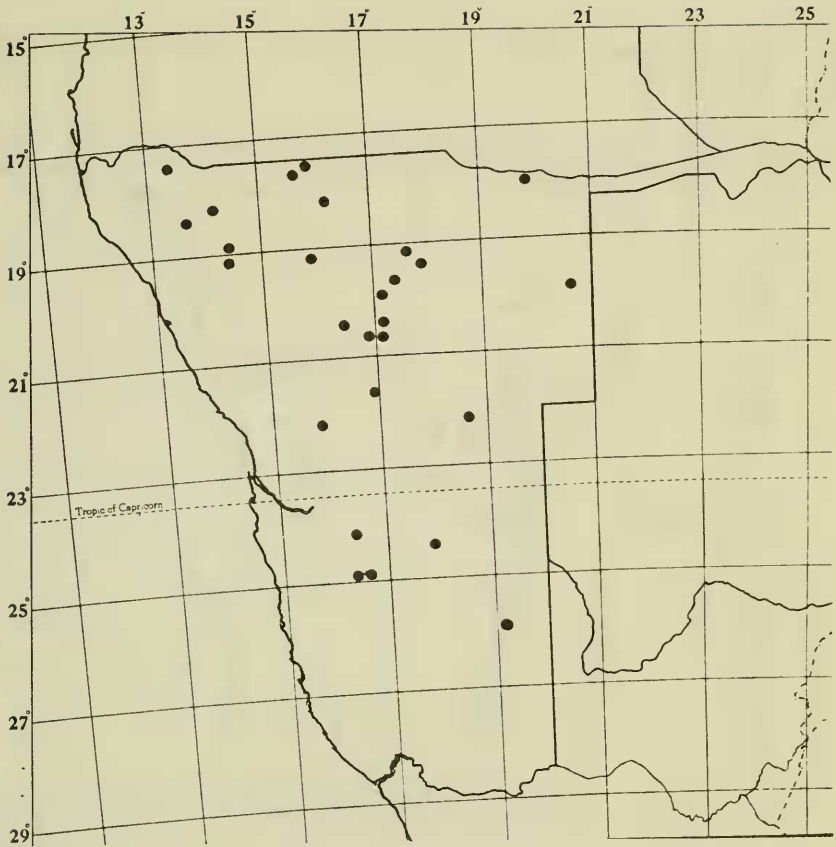


Fig. 4.  
Geographical distribution of *Commiphora glandulosa* in  
South West Africa.

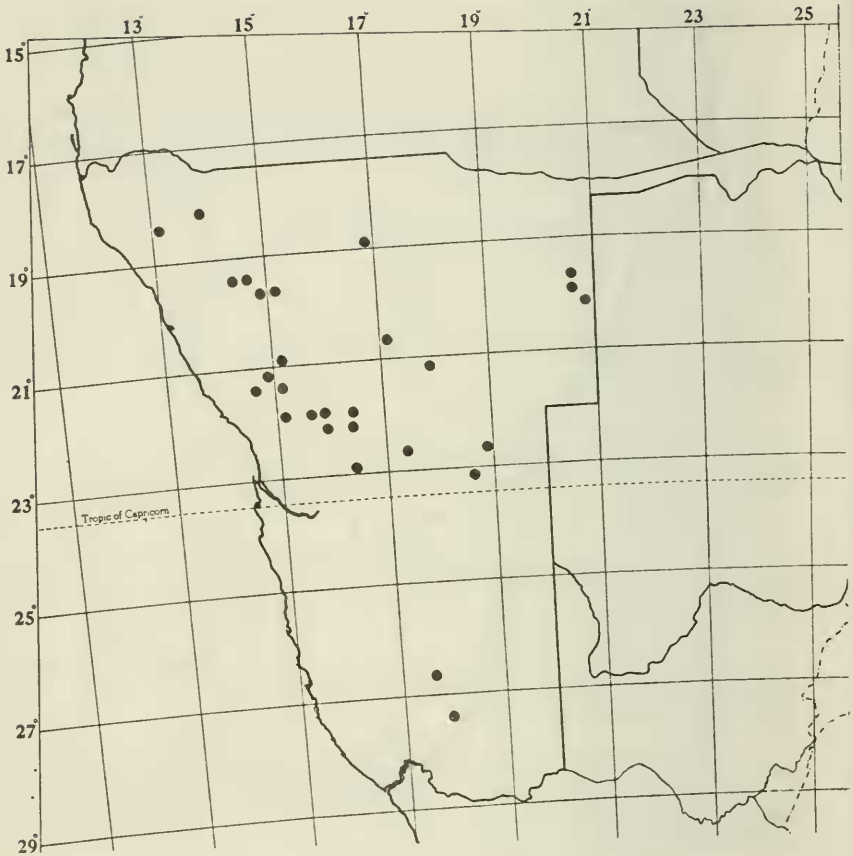


Fig. 5.  
Geographical distribution of *Commiphora pyracanthoides*  
in South West Africa.

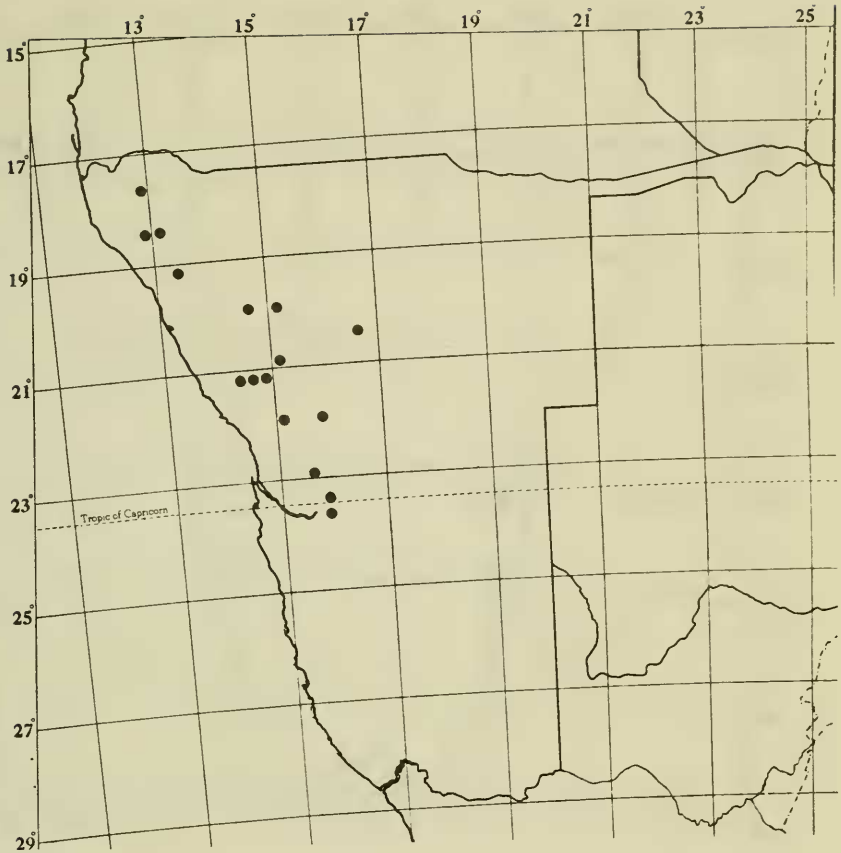


Fig. 6.  
Geographical distribution of *Commiphora virgata* in South West Africa.

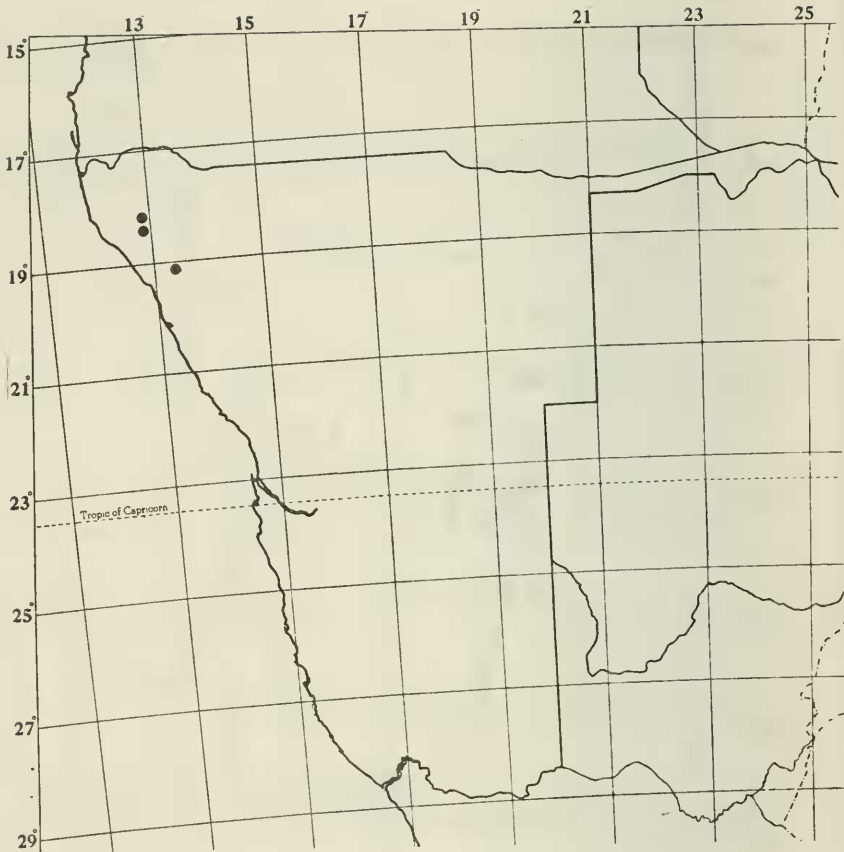


Fig. 7.  
Geographical distribution of *Commiphora giessii* in South West Africa.

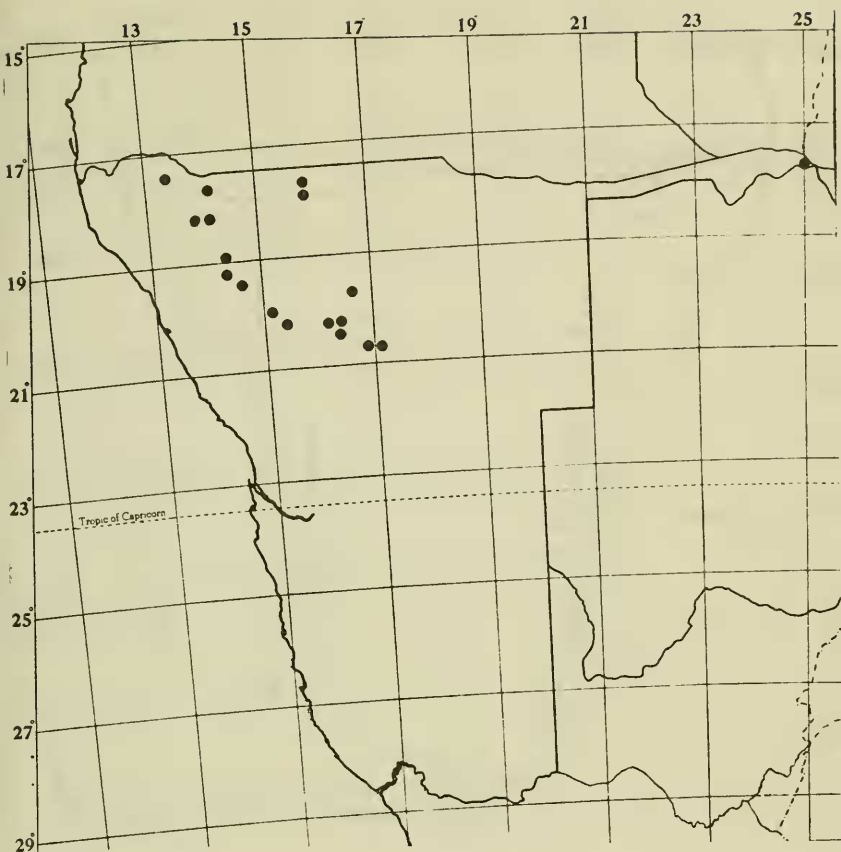


Fig. 8.  
Geographical distribution of *Commiphora mollis* in South West Africa.

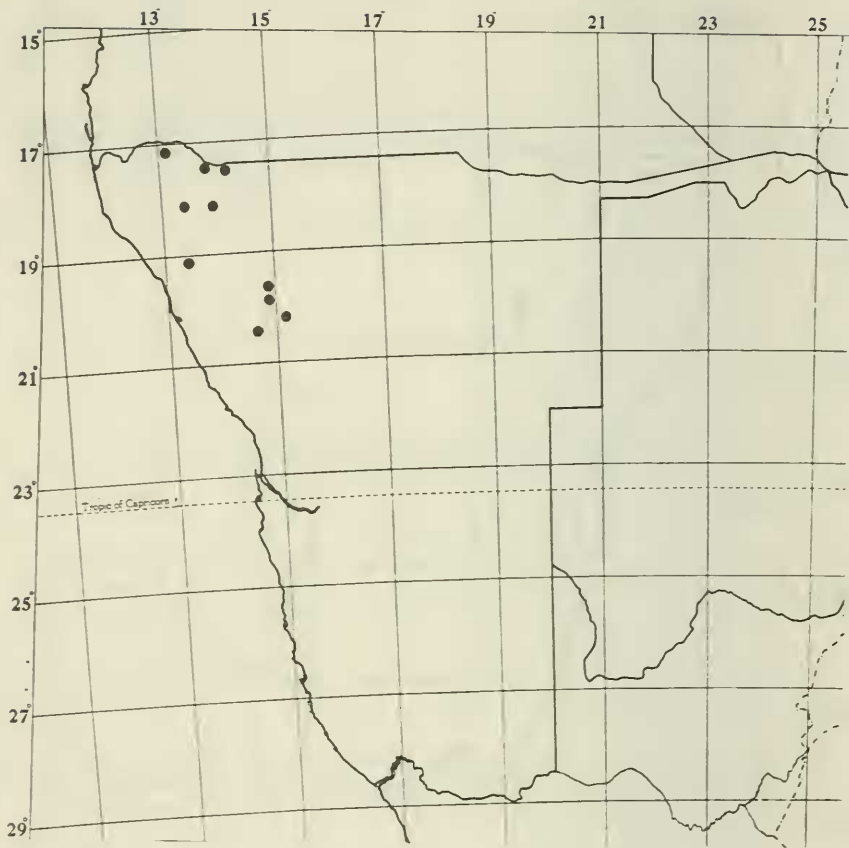


Fig. 9.  
Geographical distribution of *Commiphora multijuga* in  
South West Africa.



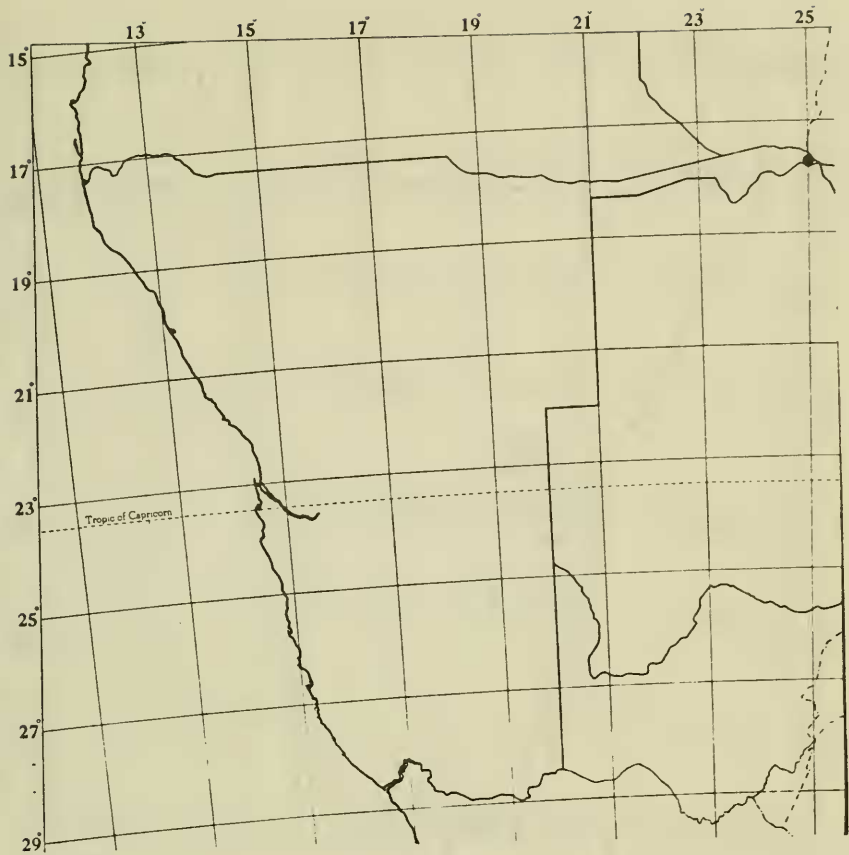


Fig. 10.  
Geographical distribution of *Commiphora mossambicensis*  
in South West Africa.

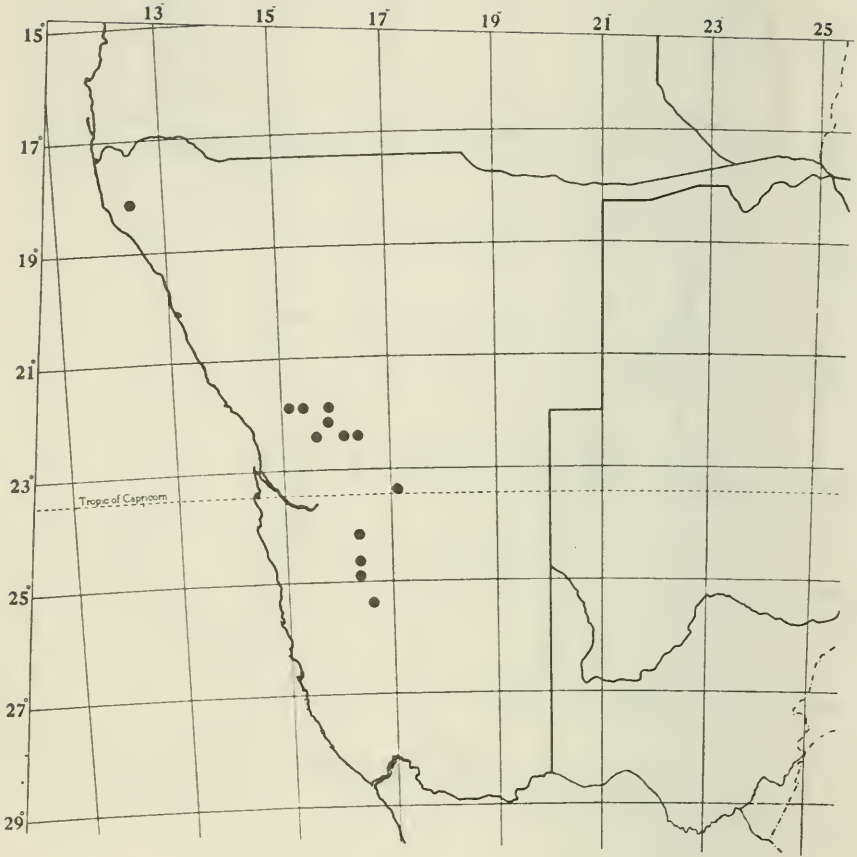


Fig. 11.  
Geographical distribution of *Commiphora dinteri* in South West Africa.

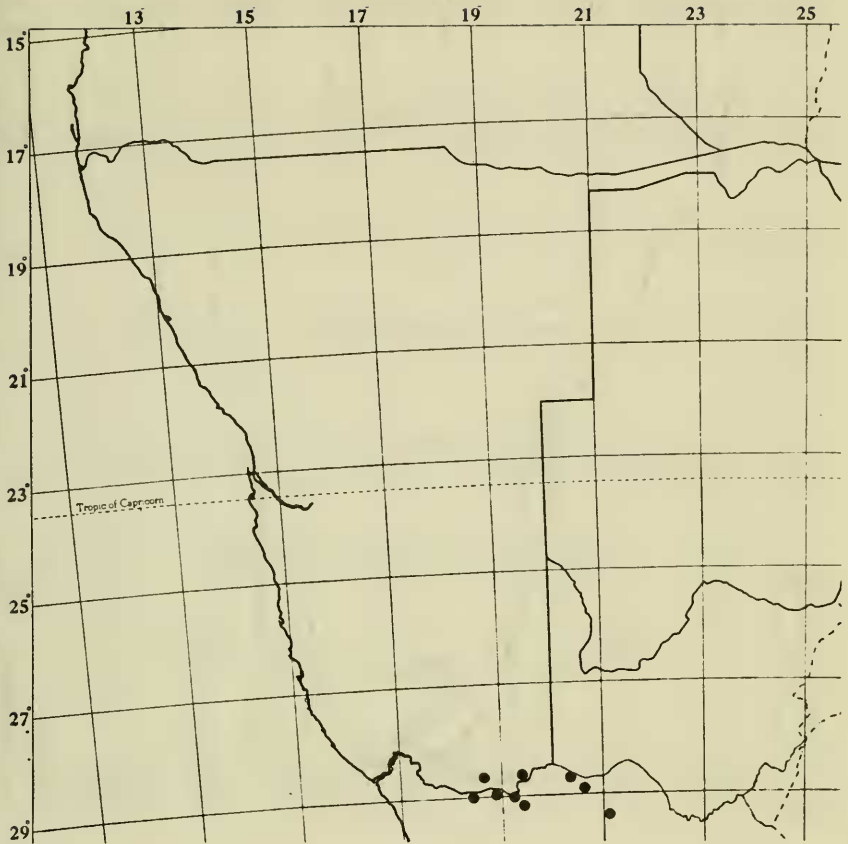


Fig. 12.  
Geographical distribution of *Commiphora gracilifrons*  
in South West Africa and north-western Cape Province, Republic  
of South Africa.

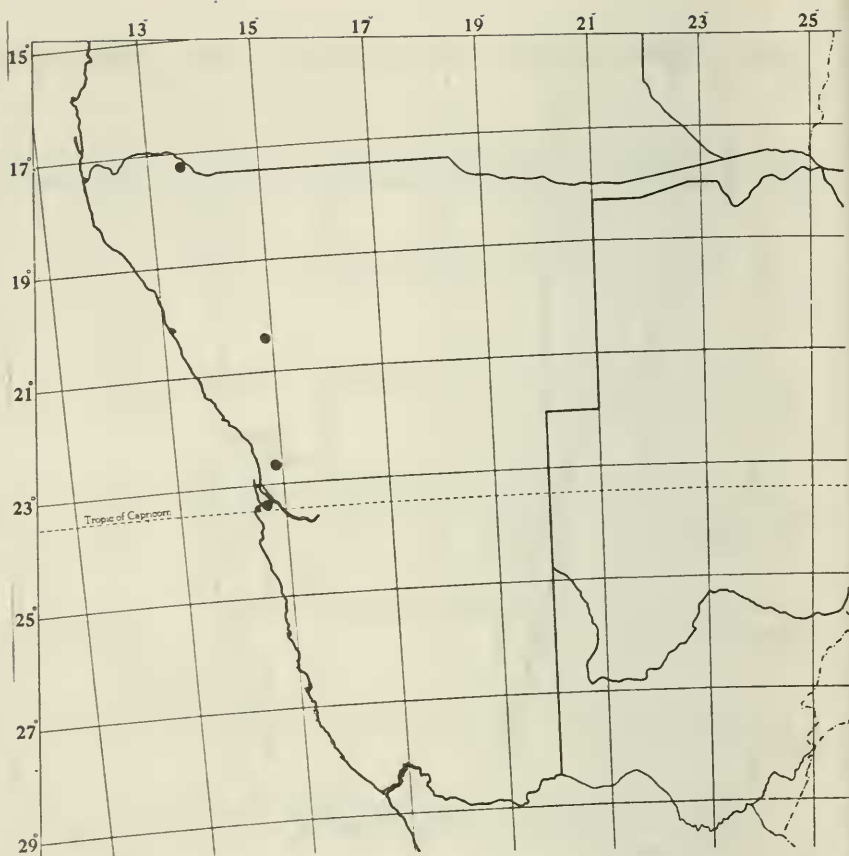


Fig. 13.  
Geographical distribution of *Commiphora ob lanceolata* in  
South West Africa.

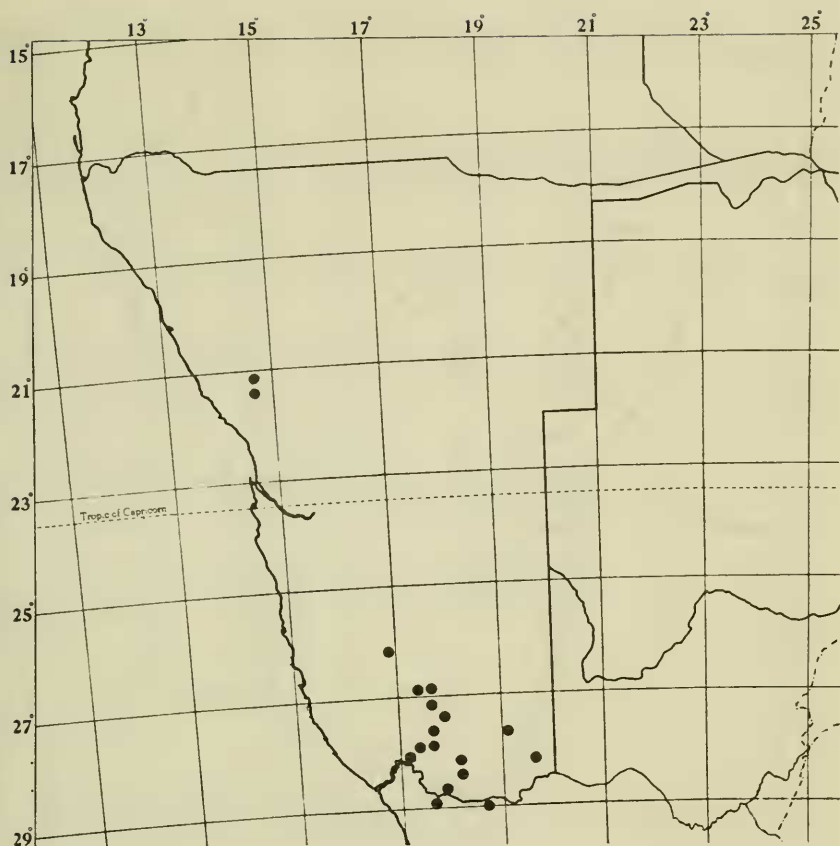


Fig. 14.  
Geographical distribution of *Commiphora namaensis* in  
South West Africa and north-western Cape Province, Republic of  
South Africa.

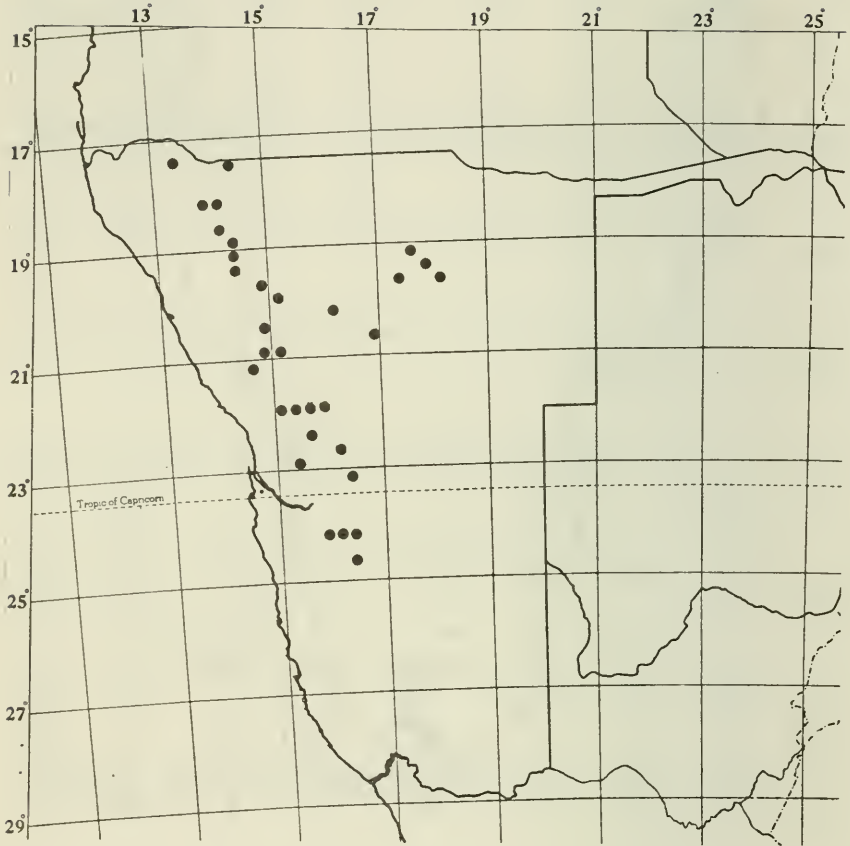


Fig. 15.  
Geographical distribution of *Commiphora glaucescens* in  
South West Africa.



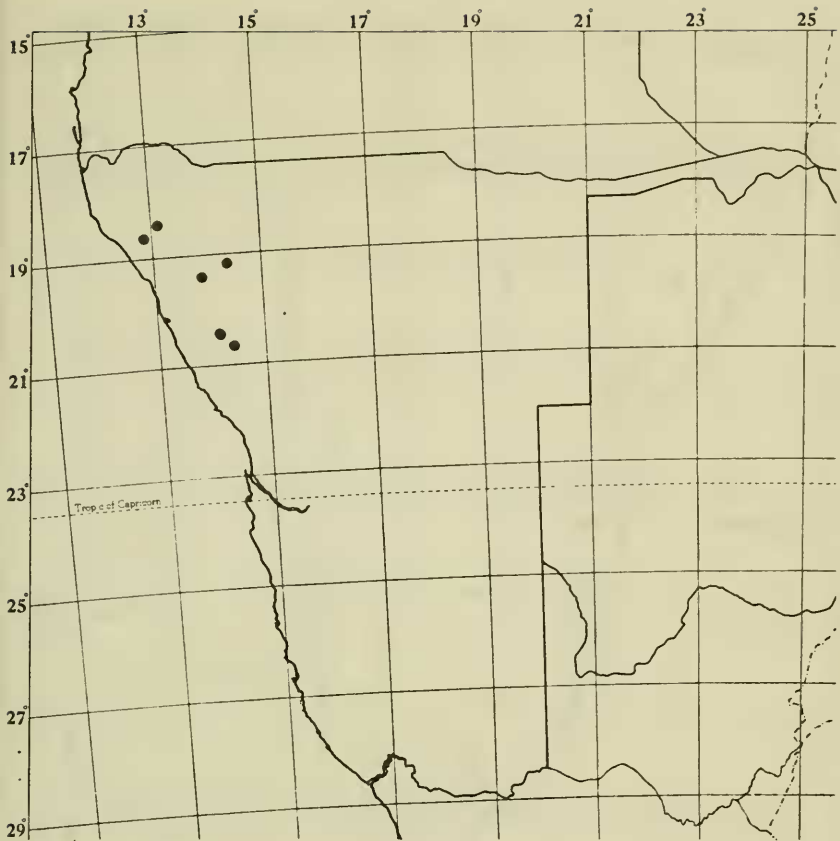


Fig. 16.  
Geographical distribution of *Commiphora anacardiifolia*  
in South West Africa.

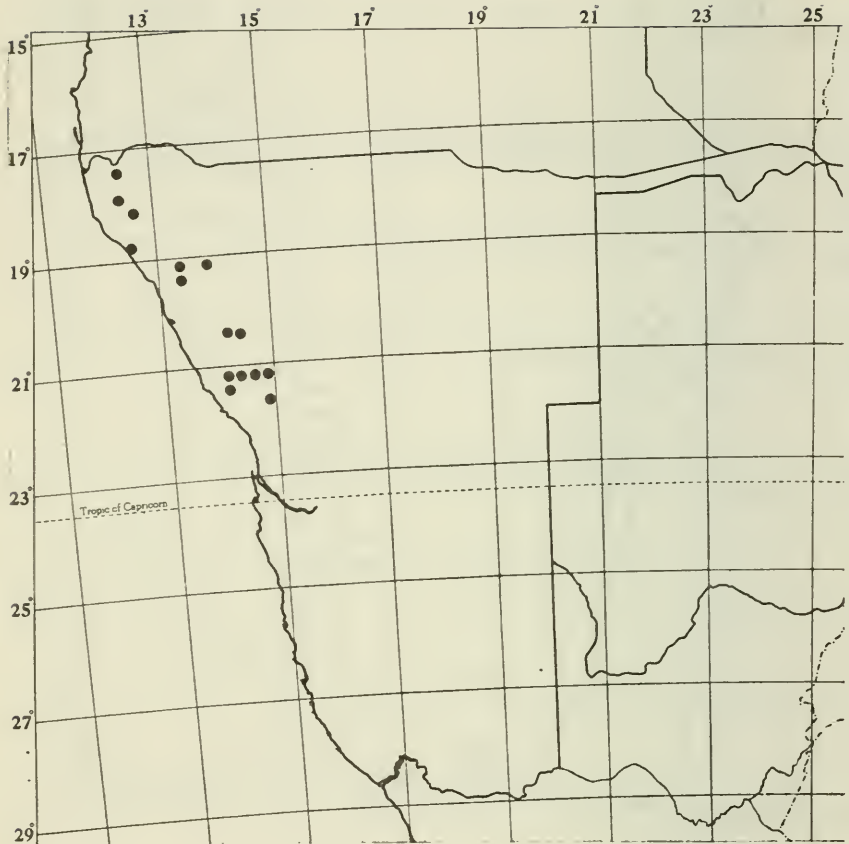


Fig. 17.  
Geographical distribution of *Commiphora wildii* in South  
West Africa.

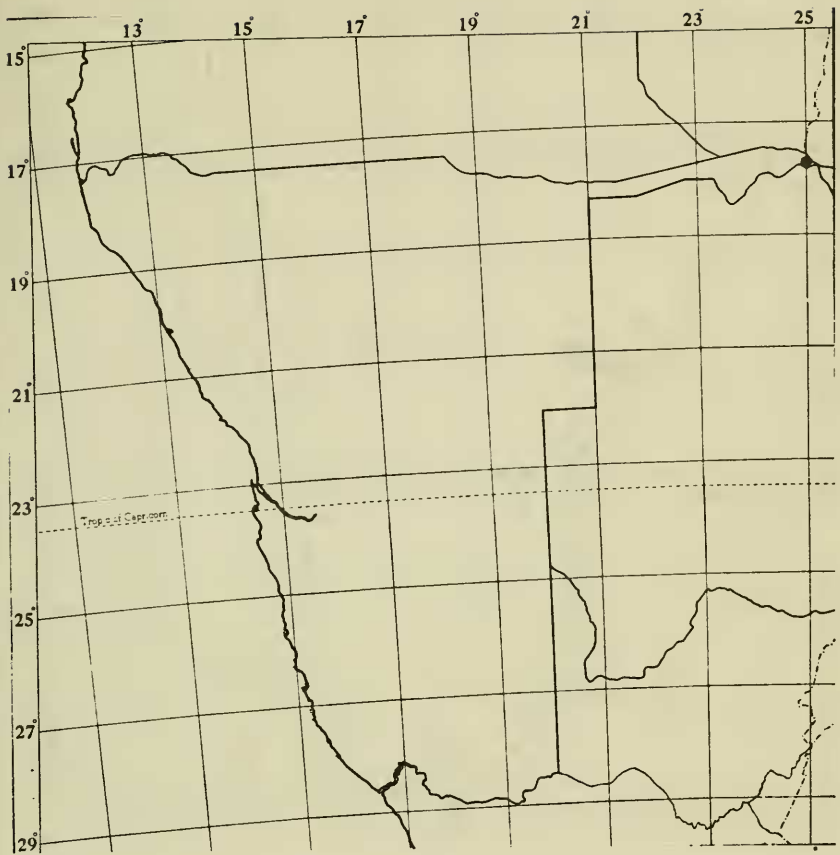


Fig. 18.  
Geographical distribution of *Commiphora edulis* in South  
West Africa.

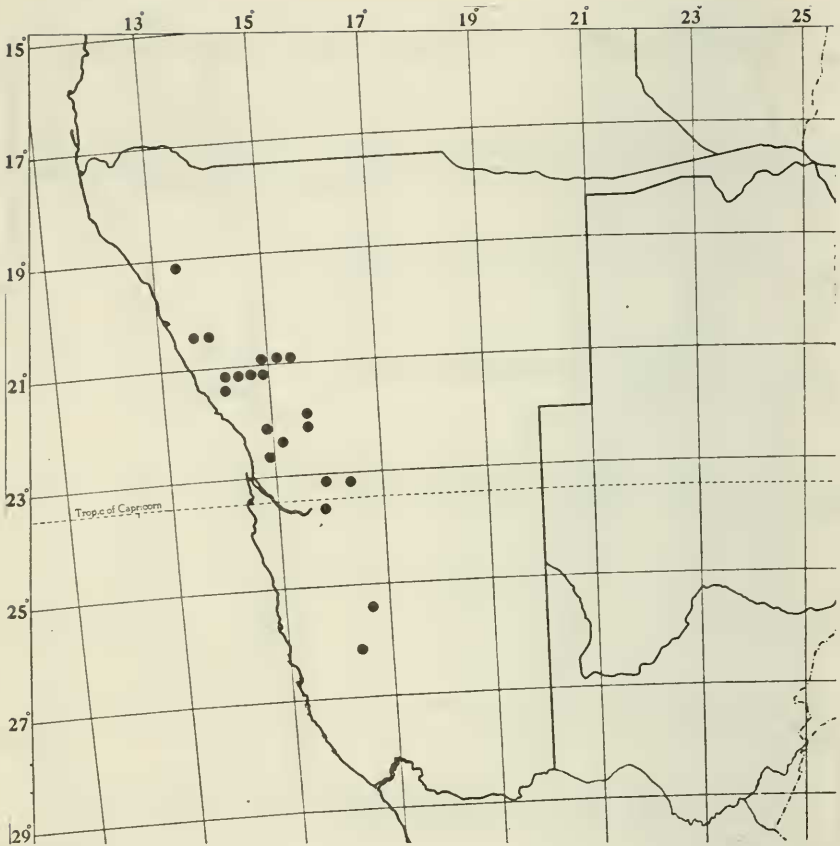


Fig. 19.  
Geographical distribution of *Commiphora saxicola* in South West Africa.

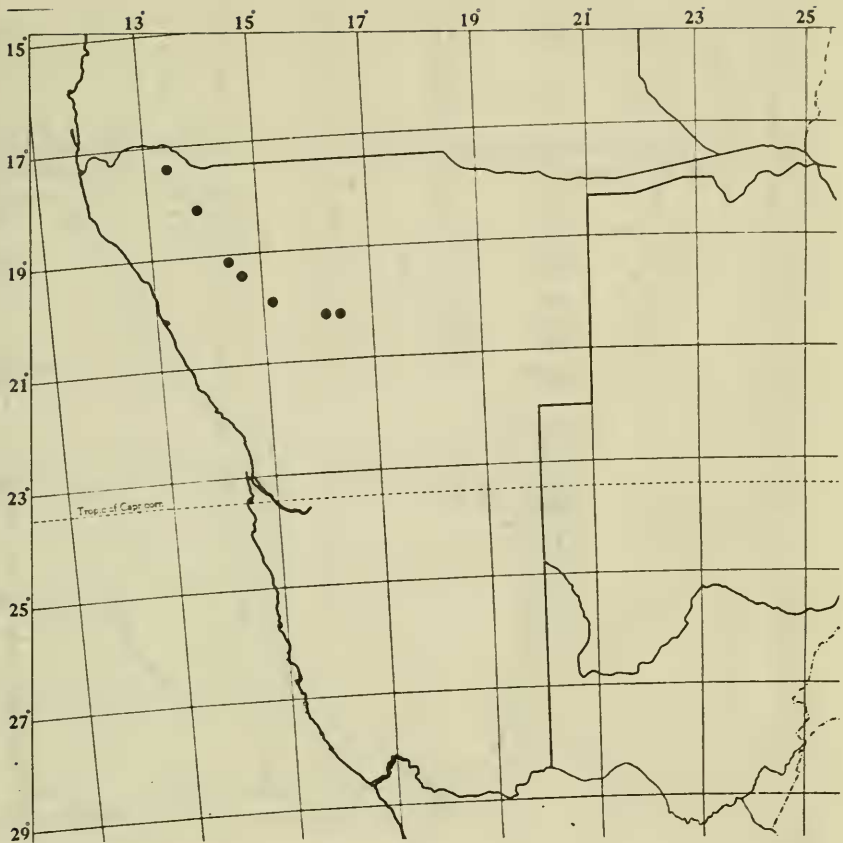


Fig. 20.  
Geographical distribution of *Commiphora crenato-serrata*  
in South West Africa.

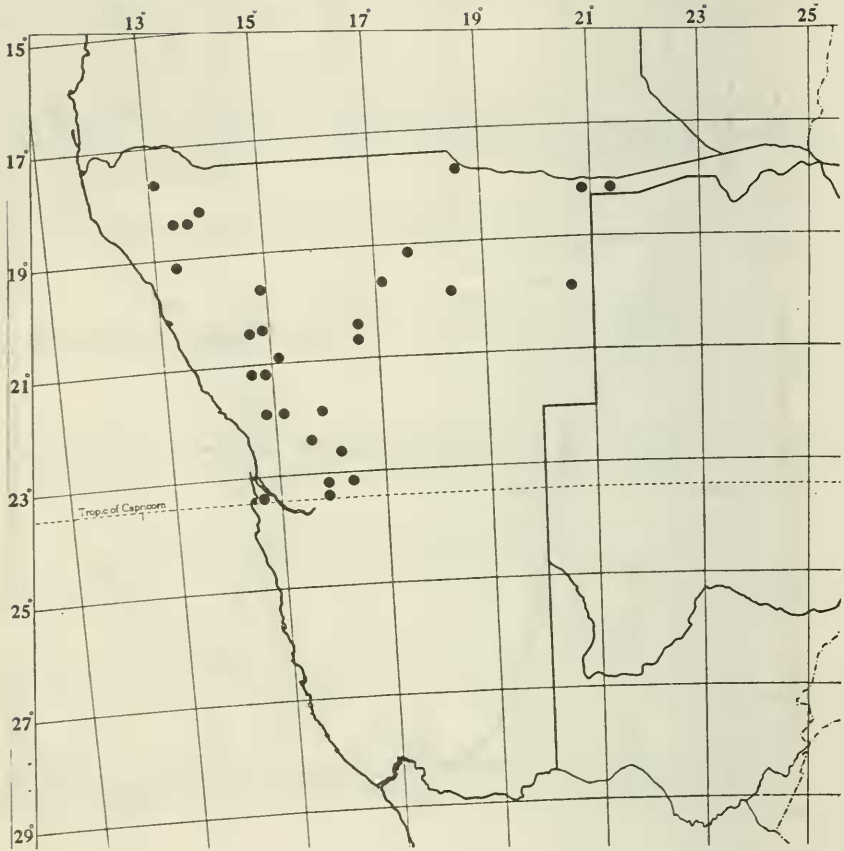


Fig. 21.  
Geographical distribution of *Commiphora tenuipetiolata*  
in South West Africa.

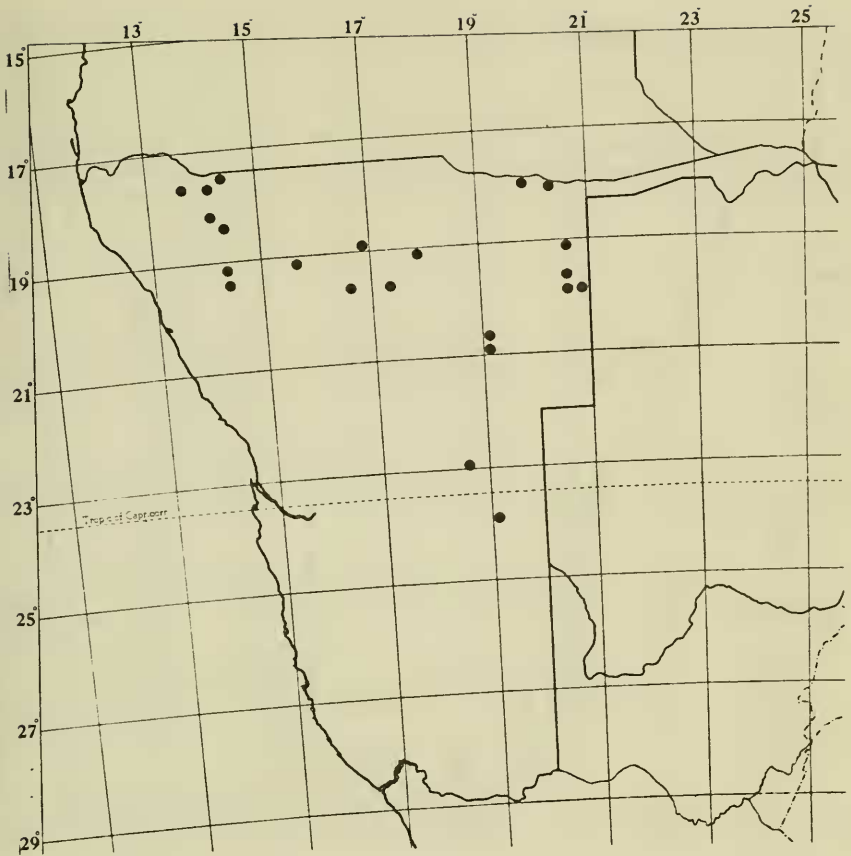


Fig. 22.  
Geographical distribution of *Commiphora angolensis* in  
South West Africa.



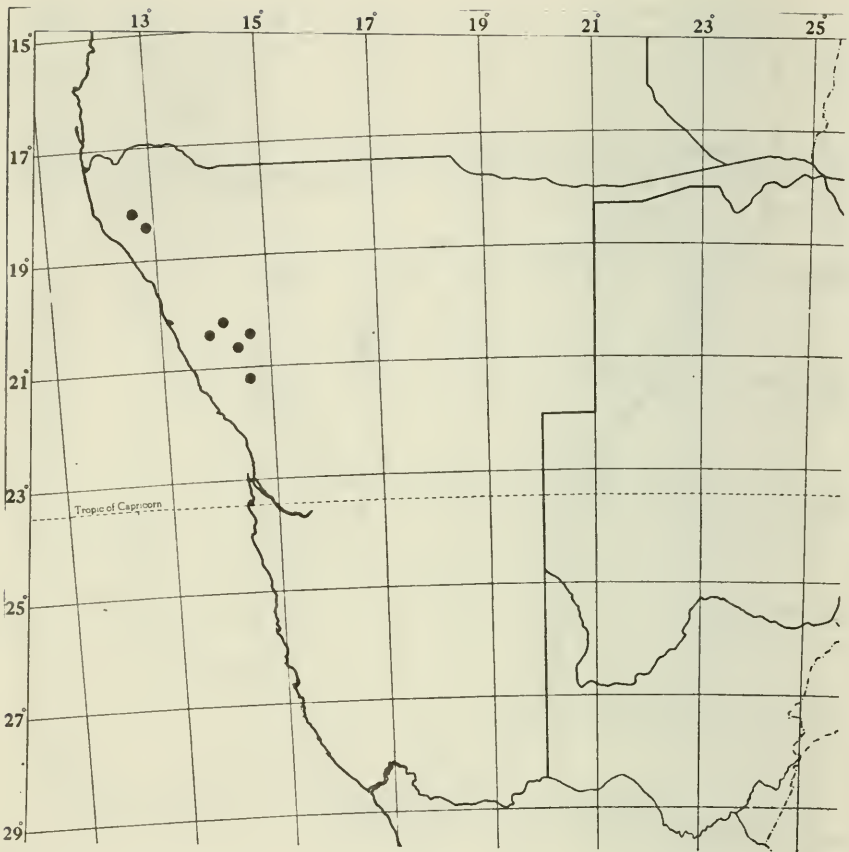


Fig. 23.  
Geographical distribution of *Commiphora krauseliana*  
in South West Africa.

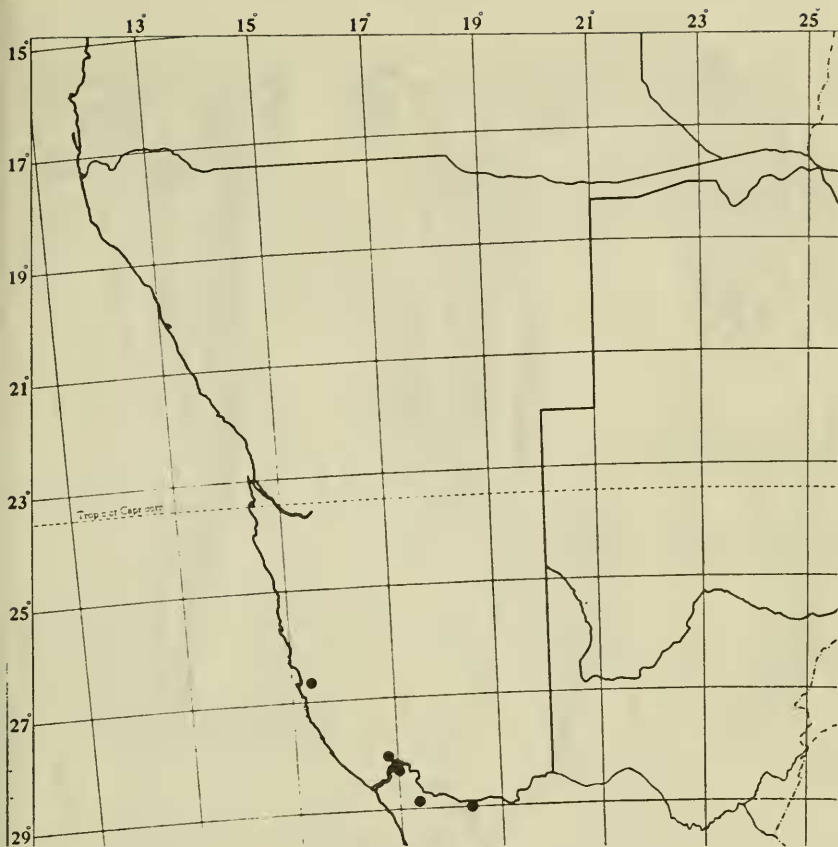


Fig. 24.  
Geographical distribution of *Commiphora capensis* in  
South West Africa and north-western Cape Province, Republic  
of South Africa.

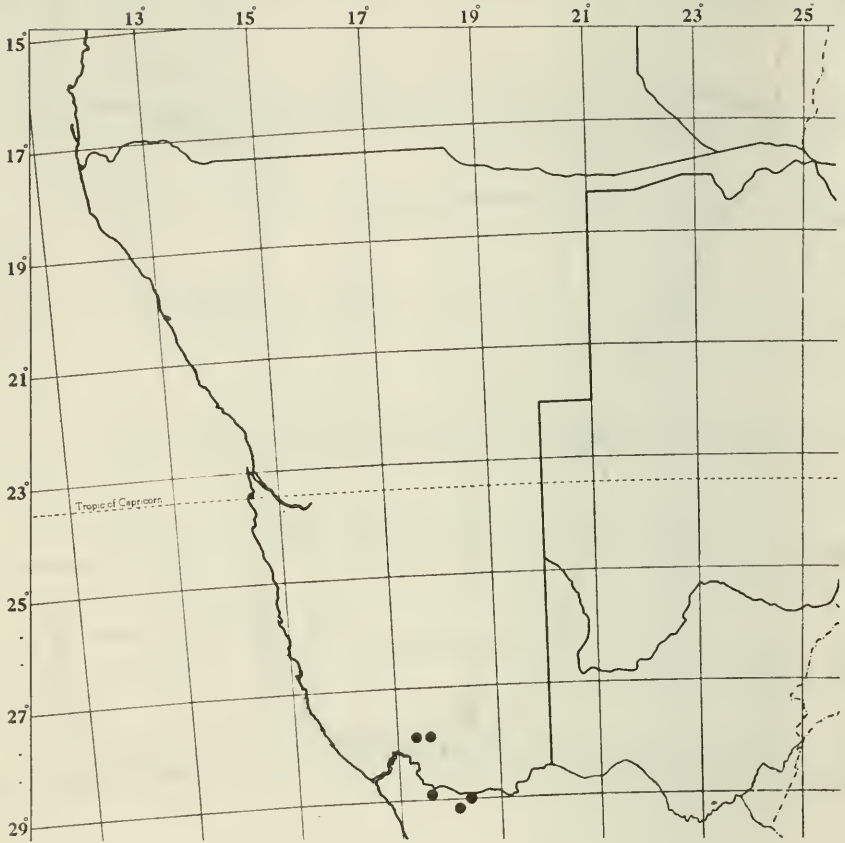


Fig. 25.  
Geographical distribution of *Commiphora cervifolia* in  
South West Africa and north-western Cape Province, Republic  
of South Africa.

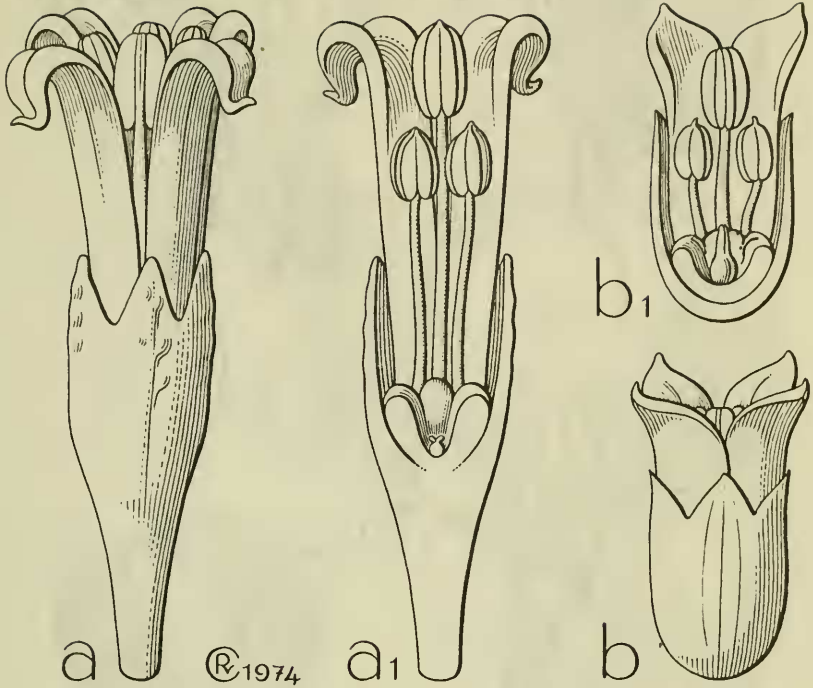


Fig. 26. Flowers of Commiphora merkeri and C. virgata (x20)

- |                   |                                                      |
|-------------------|------------------------------------------------------|
| <u>C. merkeri</u> | a, male flower                                       |
|                   | a <sub>1</sub> , longitudinal section of male flower |
| <u>C. virgata</u> | b, male flower                                       |
|                   | b <sub>1</sub> , longitudinal section of male flower |

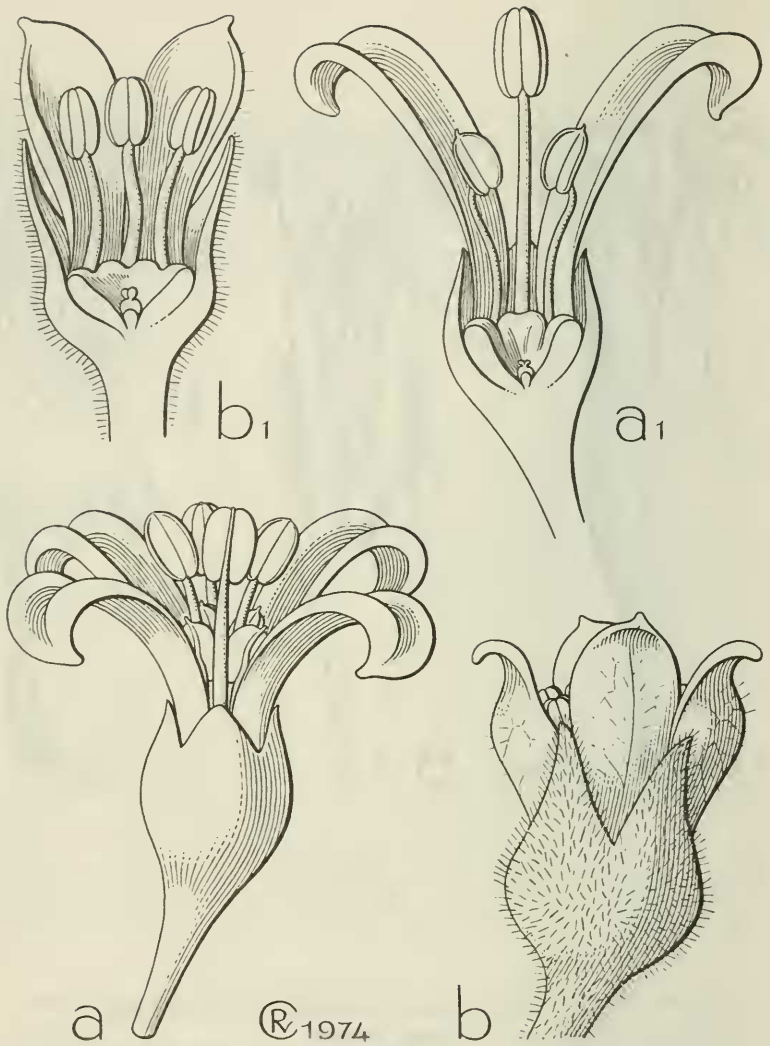


Fig. 27. Male flowers of Commiphora multijuga (a, a<sub>1</sub>) and C. wildii (b, b<sub>1</sub>)

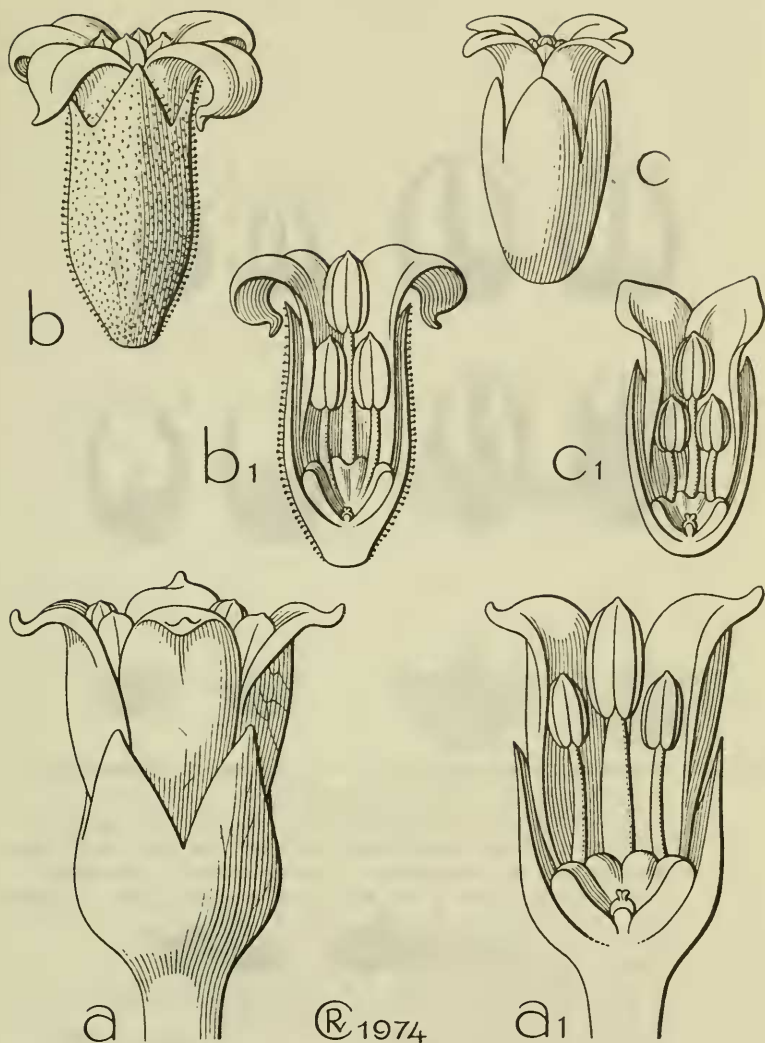


Fig. 28. Male flowers of Commiphora glaucescens (a, a<sub>1</sub>),  
C. saxicola (b, b<sub>1</sub>) and C. dinteri (c, c<sub>1</sub>)

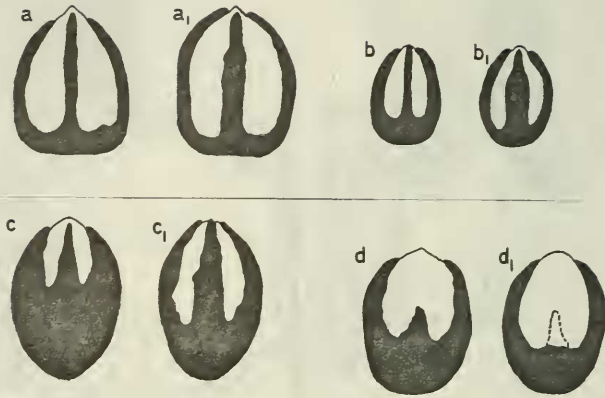


Fig. 29. Schematic representation of the putamen with pseudo-aril of twelve species of *Commiphora* (x3).  
(Two views of the putamen of each species are shown: the sketch on the left-hand side represent the view of the less convex face of the putamen, and the sketch on the right-hand side the view of the more convex face of the putamen).

- a & a<sub>1</sub>, *C. pyracanthoides*; b & b<sub>1</sub>, *C. virgata*;  
c & c<sub>1</sub>, *C. multijuga*; d & d<sub>1</sub>, *C. dinteri*;  
e & e<sub>1</sub>, *C. glaucescens*; f & f<sub>1</sub>, *C. anacardiifolia*;  
g & g<sub>1</sub>, *C. wildii*; h & h<sub>1</sub>, *C. saxicola*;  
i & i<sub>1</sub>, *C. crenato-serrata*; j & j<sub>1</sub>, *C. tenuipetiolata*;  
k & k<sub>1</sub>, *C. angolensis*; l, *C. kraeuseliana*.

